FINAL WORK PLAN

Non-Time-Critical Removal Action at the Municipality of Culebra, Puerto Rico

APPENDIX D

Accident Prevention Plan

Prepared for

United States Army District, Jacksonville
United States Army Engineering and Support Center, Huntsville

Contract Number: W912DY-05-D-0007
Task Order Number: 0001
Project Number: I02PR006802

Prepared by

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Abbreviations & Acronyms

A-E	architecture-engineering
AFB	Air Force Base
AHA	Activity Hazard Analysis
ANSI	American National Standards Institute
AR	Army Regulation
CEHNC	United States Army Engineering and Support Center
CIH	certified industrial hygienist
CFR	Code of Federal Regulations
CPR	cardiovascular pulmonary resuscitation
db(A)	decibels (A-weighted)
DFARS	Defense Federal Acquisition Regulation Supplement
DoD	Department of Defense
DOT	Department of Transportation
EEG	Ellis Environmental Group, LC
EM	Engineer Manual
EMR	experience modification rate
EOD	explosive ordnance disposal
FWS	Fish and Wildlife Service
GPS	global positioning system
HAZWOPER	hazardous waste operations and emergency response
MEC	munitions and explosives of concern
mph	miles per hour
MPPEH	material potentially presenting an explosive hazard
NOAA	National Oceanic and Atmospheric Administration
OSHA	Occupational Health and Safety Administration
PFD	personal flotation device
PPE	personal protective equipment
QC	quality control
SUXOS	senior unexploded ordnance supervisor
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
UXO	unexploded ordnance
UXOQC/SO	unexploded ordnance quality control / safety officer

1.0 Signatuare Sheet

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2.0 Background Information

2.1 Contractor

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2.2 Contract Number

W912DY-05-D-0007

2.3 Project Name

Non-Time-Critical Removal Action at the Municipality of Culebra, Puerto Rico

2.4 Project Description and Location

2.4.01 This project is to provide non-time-critical removal actions at the former naval target range on Culebra Island and its surrounding cays. All surface munitions and explosives of concern (MEC) over approximately 30 acres at the Cerro Balcon area on the Island of Culebra will be removed. All surface MEC over approximately 82 acres on the eastern end of Isla Culebrita will be removed. All surface MEC over approximately 39.5 acres from additional cays surrounding the Island of Culebra will be removed.

2.4.02 The project will be conducted at the Municipality of Culebra, Puerto Rico.

2.5 Contractor Accident Experience

2.5.01 EEG takes safety seriously in all aspects of its work. EEG is a highly regarded contractor that typically takes on the most difficult and hazardous tasks and has consistently performed work at a safe level above the safety norm. EEG's safety record is very good, with no accidents reported in the last year. EEG has had no Class A accidents involving a fatality, a permanent disability, or more than $1 million damage in equipment; no major safety violations; and only two minor safety violations over the past three years.

2.5.02 Due to EEG's safety record, the workers' compensation provider has issued the latest experience modification rate (EMR) at 0.85.

2.5.03 **Table 2-1** provides EEG's accident experience history. The data is from EEG's Occupational Safety and Health Administration (OSHA) Form 300A records beginning with first year that EEG was required to report accident and loss data in 1999 to the latest year filed.

Table 2-1. EEG Accident Experience

Accident Experience	2004	2003	2002	2001	2000	1999
EMR	0.9	0.9	0.94	1.0	1.0	0
Total Recordable Injury	3	9	8	10	18	14
Lost Workday Incidence Rate	0	0	1.3	1.3	0	0
Lost Time Incidence Rate	0	0	1.3	1.3	0	0
Total Number of Fatalities	0	0	0	0	0	0
Total Employee Hours Worked	189,690	222,323	198,296	146,109	33,099	28,380

2.6 Phases of Work and Hazardous Activities Requiring Activity Hazard Analyses

The phases of work and hazardous activities to be performed during the surface clearance of MEC on Culebra and surrounding cays are listed in the following table. Activity Hazard Analyses (AHAs) for the removal action are provided in Chapter 14 of this Accident Prevention Plan.

Table 2-2. Phases of Work for Non-Time-Critical Removal Action

Project Phase	Activity Description
Mobilization / Operation	Location survey and mapping
	Brush clearing
MEC Grids Preparation	Vegetation clearing using chain saw or bladed trimmer
	Heavy equipment operation
	Bush hog and tractor
Surface Clearance of MEC	Magnetometer survey
	Intrusive investigation of partially buried MEC
	Explosive disposal of MEC
	Scrap metal collection

3.0 Statement of Health and Safety Policy

3.0.01 EEG is committed to providing a safe and healthful work environment for its employees through the awareness and prevention of occupational injuries and illness. This plan is written in accordance with EM [Engineer Manual] 385-1-1 (3 Nov 03).

3.0.02 The objectives of EEG's health and safety policy are to reduce work-related accidents, injuries, and illness, and to promote safety and health awareness in all EEG projects. The policy objectives are to:

1. Have a safety committee for overseeing all aspects of safety and health activities for the company.
2. Conduct routine safety and health inspections to identify and eliminate unsafe working conditions or practices and to control occupational health hazards.
3. Determine the appropriate safety and health training requirements for all employees and subcontractor personnel.
4. Provide required personal protective equipment (PPE) and enforce its use.
5. Make provisions for thorough and prompt reporting and investigation of every accident to determine its cause, correct the problem, and reduce the likelihood of reoccurrence.
6. Provide a means for employees to voice safety concerns without fear of reprisal.
7. Require every site worker to comply with this policy as a condition of his or her employment and contract.

4.0 Responsibilities and Lines of Authority

4.1 Identification and Accountability of Personnel Responsible for Safety

4.1.1 Corporate Level

Mark Bagel is EEG's corporate health and safety director and the project manager. He has acted as corporate safety director for more than five years. He is responsible for assisting project managers to comply with the EEG Corporate Health and Safety Program, reviewing and monitoring compliance with project-specific health and safety plans, implementing corrective measures for health and safety deficiencies, and ensuring required training and medical monitoring of personnel. The corporate health and safety director has the authority to require corrective measures related to health and safety issues and to stop work, if required, to ensure a safe working environment.

4.1.2 Project Level

4.1.2.1 UXO Quality Control / Safety Officer

4.1.2.1.01 The UXO quality control (QC) / safety officer (UXOQC/SO) (to be determined) will be a United States citizen and graduate of one of the following schools or courses:

- United States Army Bomb Disposal School, Aberdeen Proving Ground, MD
- United States Naval EOD [explosive ordnance disposal] School
- EOD Assistants Course, Redstone Arsenal, AL; EOD Assistants Course, Eglin Air Force Base (AFB), FL; or a Department of Defense (DoD)-certified equivalent course

4.1.2.1.02 This individual shall have experience in MEC operations and supervising personnel, and shall have at least 10 years of UXO experience. In addition, this individual shall have the specific training, knowledge, and experience necessary to implement the Accident Prevention Plan and verify compliance with applicable safety and health requirements. This individual must be able to perform all functions enumerated for UXO sweep personnel and UXO Technicians I, II, and III. In addition, the UXOQC/SO must have the ability to implement the approved MEC and explosives safety program in compliance with all DoD, federal, state, and local statutes and codes; analyze MEC and explosives operational risks, hazards, and safety requirements; establish and ensure compliance with all site-specific safety requirements for MEC and explosives operations; enforce personnel limits and safety exclusion zones for MEC removal operations and MEC transportation, storage, and destruction; and conduct safety inspections to ensure compliance with MEC and explosives safety codes.

4.1.2.1.03 The UXOQC/SO is responsible for performing the routine duties for health and safety and QC functions, with the assistance of the health and safety director, and will administer the Site-Specific Health and Safety Plan (Attachment B). Responsibilities include:

- Performing regular and frequent site inspections to find hazards and to observe personnel at work
- Stopping work when necessary to prevent injury or illness
- Ensuring personnel and environmental health and safety
- Investigating all injuries and illnesses
- Developing and implementing corrective action plans to eliminate or mitigate hazards

4.1.2.2 Senior UXO Supervisor

4.1.2.2.01 The senior UXO supervisor (SUXOS) will be Michael Zaloudek, who has the following training and certifications:

- Basic EOD School, Indian Head
- Nuclear Weapons Orientation Advanced Course, Kirtland AFB, NM
- United StatesArmy Chemical/Biological School; Redstone, AL
- Explosive/Nuclear/Missile Safety School, Lowery AFB, CO
- United States Air Force Munitions Officer Course, Lowery AFB, CO
- OSHA 40-Hour Hazardous Waste Site Workers Course
- OSHA 8-Hour Supervisory Training Course

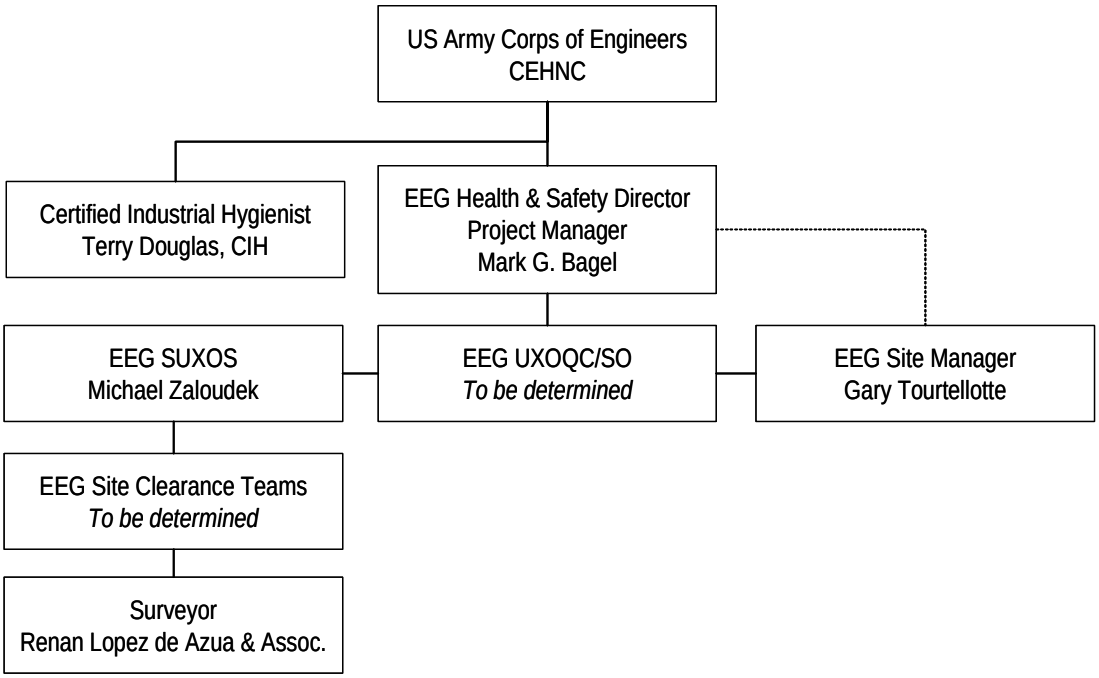
4.1.2.2.02 Duties and responsibilities will include:

- Conducting and supervising equipment maintenance and function checks
- Supervising surface clearance investigations
- Job safety during all MEC operations
- Ensuring that all personnel are properly trained
- Ensuring that all MEC operations field logs are updated daily
- Ensuring safe, compliant transportation of explosives on site
- Ensuring that explosives management activities are conducted in accordance with the Work Plan
- Ensuring that site preparation activities are completed in accordance with the Work Plan
- Ensuring that MEC operations are conducted in strict conformance with the Work Plan

4.2 Lines of Authority

The organization chart in **Figure 4-1** presents the lines of authority that will be in place to ensure that this Accident Prevention Plan is followed throughout the completion of the project.

Figure 4-1. Project Health and Safety Organization



5.0 Subcontractors and Suppliers

5.1 Identification of Subcontractors and Suppliers

EEG will self-perform all work for this contract except the surveying. **Table 5-1** presents known subcontractors and suppliers.

Table 5-1. Subcontractors and Suppliers

Subcontractors and Suppliers	Items or Tasks Provided
Renan Lopez de Azua & Associates	Surveyors
Severn Trent Laboratories (STL) Chicago	Analytical laboratory
Halliburton Explosives	Jet perforators and detonating cord
Slurry Corporation	Binary explosives and blasting caps
Atlantic Explosives	Other Explosives

5.2 Means for Control and Coordination of Subcontractors and Suppliers

5.2.01 EEG will schedule and coordinate work activities of the subcontractors and suppliers on the project with the goal to complete the project on time and within budgetary constraints.

5.2.02 EEG holds the sole responsibility for the scheduling and delivery of materials from suppliers. To meet the schedule, EEG will order the materials with the longest lead time first. Priorities for ordering will be set on the estimated time for deliveries.

5.2.1 Safety Responsibilities of Subcontractors and Suppliers

All subcontractors shall adhere to this Accident Prevention Plan and shall assume the responsibilities described herein.

6.0 Training

In accordance with 29 Code of Federal Regulations (CFR) 1910.120 and other OSHA regulations, all personnel assigned to perform removal operations will have the required hazardous waste operations and emergency response (HAZWOPER) training prior to participating in site activities. Surveyors, brush cutting personnel, and other incidental personnel will be required to have site-specific training covering the hazards at the site and the basic contents of this Accident Prevention Plan. Documentation of all training is required to be kept on site.

6.1 Subjects of Safety Indoctrination

Safety indoctrination of employees shall include a discussion of the following subjects:

- Identification of project, scope of work, and project location
- Identification of potential hazards and assessment of hazards
- Identification of training and medical requirements
- Identification of personnel protection requirements and safe working procedures
- Identification of documents and forms that comprise the complete safety program
- Identification of monitoring and site control programs
- Identification of spill control procedures
- Identification of emergency response and notification plan

6.2 Mandatory Training and Certifications Applicable to Project

Table 6-1 lists the applicable mandatory safety training and certifications for employees on this project.

Table 6-1. Training and Certifications

Personnel	Training	Requirements
MEC removal employees (UXO technicians)	HAZWOPER, including blood borne pathogens and hazard communication	40-hour and 8-hour refreshers
	First aid / Cardiovascular pulmonary resuscitation (CPR)	At least 2 on site at all times
	Graduate of EOD / Bomb Disposal School / EOD Assistants Course	UXO personnel certification
	Site-specific safety indoctrination	Prior to site entry
Surveyors, equipment operators, and brush cutting personnel	Site-specific safety indoctrination	Prior to site entry

Personnel	Training	Requirements
Project and site manager	HAZWOPER, including blood borne pathogens and hazard communication	40-hour and 8-hour refreshers
	First aid / CPR	At least 2 on site at all times
	Site-specific safety indoctrination	Prior to site entry
Site visitors and site administrator	Site-specific safety indoctrination	Prior to site entry

6.3 Requirements for Emergency Response Training

All UXO technicians, the site manager, and the project manager will have completed the 40-hour HAZWOPER course. At least two team members will be trained by the Red Cross or equivalent in first aid and CPR. On-site EEG personnel will receive training in controlling exposures to blood-transmitted pathogens.

6.4 Requirements for Supervisory and Employee Safety Meetings

6.4.1 Tailgate Safety Briefing

The purpose of this training is to identify potential hazards and risks that may be encountered during that day's activities. All contractor and subcontractor employees and any government personnel present will attend this training. This training will be given each day, before work starts on site, and will be conducted by the UXOQC/SO. It will be documented on the Tailgate Safety Briefing / Training Form (included in Appendix F of the Work Plan), which will include the date, attendees, and topics covered.

6.4.2 Additional Training

Training will be provided in the use of safety equipment, emergency medical procedures, emergency assistance notification procedures, and accident prevention. In addition, planned activities will be discussed to ensure that the work can be carried out safely and effectively. All contractor and subcontractor employees and any government personnel present will attend this training, which will be conducted by the UXOQC/SO or his designee during the tailgate safety briefing. This training will also be documented on the Tailgate Safety Briefing / Training Form.

6.4.3 Debriefing

During the tailgate safety briefing, the UXOQC/SO will debrief the team concerning items observed during his inspections, corrective actions, and good safety practices observed.

7.0 Safety and Health Inspections

7.1 Inspection Procedures

7.1.01 The UXOQC/SO will perform regular safety inspections of the project and will complete the Safety Inspection Checklist (included in Appendix F of the Work Plan) during the inspection. The checklist will be submitted to the project manager. A one-week period will be allowed for improvements to be made. The UXOQC/SO will perform a follow-up inspection to ensure that all applicable improvements have been made to the project site.

7.1.02 The EEG project manager may conduct safety inspections during the period of performance. An inspection report will be filed to document compliance and non-compliance issues observed.

7.2 External Inspections and Certifications

Currently no requirements exist for any external inspections or certifications.

8.0 Safety and Health Expectations, Incentive Programs, and Compliance

8.0.01 EEG corporate policy includes safety in all aspects of its operation. This plan has been developed to convey the safety message to EEG employees. It is EEG's responsibility to:

- Respond to employee reports of hazards in the workplace
- Ensure that each workplace is inspected routinely for hazardous conditions (EEG will post notices of unsafe or unhealthful working conditions found during the inspections for a minimum of three working days, or until the hazard is corrected, whichever is later)
- Take prompt action to ensure that hazardous conditions are eliminated (imminently dangerous conditions will be corrected immediately)
- Acquire, maintain, and require use of appropriate protective and safety equipment
- Require supervisors to submit an Accident / Injury Investigation form for all work-related accidents, injuries, or occupational illnesses experienced by employees under their supervision

8.0.02 Every EEG employee is responsible for:

- Complying with all OSHA and approved occupational safety and health standards, policies, and directives
- Performing all work in accordance with EM 385-1-1 (3 Nov 03)
- Using appropriate provided protective and safety equipment

8.0.03 EEG does not offer a safety incentive program.

8.0.04 Compliance with all applicable safety regulations and procedures is mandatory.

9.0 Accident Reporting

The UXOQC/SO will be responsible for all accident reporting and documentation, including:

- Maintaining and submitting exposure data
- If a reportable injury, illness, or accident occurs at the job site, ensuring that the appropriate documentation will be completed and forwarded to EEG within 48 hours
- Ensuring that the accident is discussed in the following tailgate safety briefing
- Immediately notifying all appropriate designated government personnel of major accidents
- Completing appropriate Accident / Injury Investigation forms

9.1 Logs, Reports, and Recordkeeping

All recordkeeping will be in accordance with applicable OSHA standards and regulations. Appendix F of the Work Plan contains sample safety logs and forms. The following logs and records (at a minimum) will be completed and retained by the UXOQC/SO.

9.1.1 Safety Log

The UXOQC/SO will maintain a safety log of all safety-related activities and will be responsible for ensuring that safety and health activities for the day, as well as tailgate safety briefing minutes, are part of the log. When safety and health deficiencies are noted during daily inspections, the measures, timetable, and individual responsible for correcting the deficiencies will be noted in the safety log.

9.1.2 Tailgate Safety Briefing / Training Form

The UXOQC/SO is responsible for ensuring that all training conducted relative to job site activities is documented appropriately on the Tailgate Safety Briefing / Training Form.

9.1.3 Visitor Log

A Visitor Log will be maintained at the entrance to each work site to record visitors to the job site.

9.1.4 Reports

The following reports will be submitted as required by applicable USACE and OSHA regulations.

- Medical monitoring records of employee(s) will be kept on site by the UXOQC/SO.

- If a reportable injury, illness, accident occurs at the job site, the appropriate form will be completed and forwarded within 24 hours to EEG. The Accident / Injury Investigation form will be completed for all accidents and illnesses that are work-related. If a serious accident occurs that results in lost days and/or damage in excess of $2,000, EEG will submit to the United States Army Engineering and Support Center (CEHNC) project manager ENG Form 3394, United States Army Corps of Engineers (USACE) Accident Investigation Report, in accordance with AR [Army Regulation] 385-40. A copy of this form is included in Appendix F of the Work Plan.

10.0 Medical Support

10.1 Rescue and Medical Duties

10.1.01 Team members are to be alert to the dangers associated with the site at all times. If an unanticipated hazardous condition arises, they will stop work, evacuate the immediate area, and notify the UXOQC/SO. Emergency situations should be handled in a calm and orderly fashion. The UXOQC/SO will be responsible for ensuring quick and effective response to all hazardous situations and accidents.

10.1.02 In case of a medical emergency that threatens life, limb, or sight, the UXOQC/SO or his designee will immediately contact the Culebra Community Medical Center (telephone 787-742-3511) for medical assistance. If serious trauma or a life-threatening accident or illness has occurred, the Community Medical Center will be notified to send for airlift support from Life Fllight or local aircraft support to the main island.

10.1.03 The route map to the Community Medical Center will be posted on the project safety bulletin board on site. Additionally, all site personnel will drive to the medical center to learn the location. The route map is included in the Site-Specific Health and Safety Plan (Attachment A).

10.2 On-Site Personnel Trained in First Aid and CPR

- Site manager – Gary Tourtellotte
- SUXOS – Michael Zaloudek
- UXOQC/SO – to be determined
- UXO team personnel – to be determined

10.3 Off-Site Medical Treatment Facility

10.3.01 The primary off-site treatment for non-life threatening illnesses or injuries that occur on the job site will be provided at the Culebra Community Medical Center (telephone 787-742-3511) located at Calle William Font Final. For more serious conditions, transport to Fajardo or San Juan, Puerto Rico, may be necessary and will be coordinated through the Culebra Community Medical Center.

10.3.02 Acute care services are provided by the San Pablo del Este Hospital (telephone 787-863-0505), located at General Valero Ave. #404 in Fajardo, Puerto Rico. The hospital provides

medical, ambulatory and emergency services to the community of Fajardo and nearby communities Luquillo, Ceiba, Río Grande, Culebra, and Vieques.

11.0 Personal Protective Equipment

AHAs will be conducted by the UXOQC/SO or the health and safety director to determine what PPE is required for a given task. This section discusses the hazard classes that are considered when determining PPE requirements. PPE requirements are provided in the AHAs for this project, presented in Chapter 14.

11.1 Impact

The impact hazard classification shall be used to assess the various risks associated with machinery, equipment, tool use, objects, and an employee's position in relationship to the work being performed. Contusions, crushing, pinching, vibration, and repeated shock are some of the harmful results that can be attributed to impact. Examples of impact hazards can include falling tools, materials, and packaging; hammers; presses; and heavy machinery and equipment operation.

11.2 Penetration

The penetration hazard classification shall be used to assess the various risks associated with machinery, equipment, hand tools, laboratory implements, materials, and objects. Cuts, punctures, and lacerations can result from objects penetrating clothing, PPE, and footwear. Examples of penetrating hazards include razors, punches, power-actuated tools, and sharp metal surfaces or edges.

11.3 Compression

The compression hazard classification shall be used to assess the risks associated with machinery, equipment, packaging, material handling, vehicles, and any other devices which when moving could pose a physical threat to workers. Examples of compression hazards include work involving rolling stock, presses, lifts, powered cylinders and pistons (hydraulic, pneumatic, etc.), heavy goods and materials, and warehousing.

11.4 Chemical

The chemical hazard classification includes a wide variety of materials and conditions, which can be both physical and health hazards. To complicate the assessment, it should be recognized that not all individuals are similar with respect to how they may be adversely affected by a chemical, including concentrations that may be published as safe result in a worker experiencing symptoms. Risks associated with chemicals include contact, absorption, inhalation, ingestion, and injection.

Examples of chemical hazards include but are not limited to corrosives, solvents, oils, fuels, drugs, and biological agents.

11.5 Heat

The heat hazard classification shall be used to assess the risks associated with process machinery, equipment, electrical and liquid processes, and any other heat-generating mechanisms or devices. Examples of heat hazards include work involving the use of flame, hot liquids, packaging operations, and ovens.

11.6 Harmful Dusts

The harmful dust hazard classification shall be used to assess various risks associated with operations where the generation of dust may produce a respiratory or contact hazard. The primary focus should be the source (type) and degree of its generation. Some examples of operations where harmful dusts can be generated include polishing, sawing, sanding, cleaning, and grinding. Dust generation will be minimized by wet cutting where applicable.

11.7 Radiation

The radiation hazard classification includes light, infrared, ionizing, and non-ionizing sources. Risk associated with many types of machinery and equipment involve radiation exposure. It is incumbent upon managers/supervisors to adequately assess this form of hazard and protect workers through the use of appropriate engineering controls, work practices, PPE, or a combination of each. Some examples of radiation hazards include visual display terminals, lasers, microwave, open flames, power transmission, and manufacturing of products with radiation sources (medical, mining, nuclear fuel etc.).

11.8 Electrical

The electrical hazard classification shall be used to assess the various risks associated with operations where exposure to electrical energy may pose a hazard. While a number of work activities are covered under Lockout / Tagout (Control of Hazardous Energy), many other types of work tasks and operations expose workers to risk due to the presence of electrical energy. Some examples of operations where electrical hazards should be assessed include most machinery, equipment, and tool use.

11.9 Motion

The motion hazard classification shall be used to assess the risks associated with repeated motions made by a worker operating a tool or machine, which can lead to a number of injuries collectively called cumulative trauma injuries. Cumulative trauma injuries are difficult to characterize because the appearance of symptoms vary from person to person. Factors such as frequency of activity, forces applied, and duration of force and activity require analysis. Some examples of operations where motion hazards exist are typing, use of spray guns, power tools, and machine handles, and use of tools such as hammers and ratchets.

11.10 Noise

11.10.01 PPE equivalent to the combination of earplugs and earmuffs shall be required for sound-pressure levels exceeding 115 dB(A) [decibels A-weighted] steady state. Noise hazard areas shall be marked with caution signs indicating both the presence of hazardous noise levels and the requirement for hearing protection.

11.10.02 Protection against the effects of hazardous noise exposure will be provided whenever sound-pressure levels exceed the limits and/or exposure times (see Attachment A, Site-Specific Health and Safety Plan).

11.11 Water

United States Coast Guard (USCG)-certified life jackets or work flotation vests will be worn by all employees working on or near the water at all times during project activities. The UXOQC/SO shall ensure compliance with this requirement.

12.0 Plans Required by EM 385-1-1 (Safety Manual)

This chapter presents the plans (programs, procedures) required by EM 385-1-1 (Safety Manual) that apply to the activities required for surface clearance of MEC (applicable EM 385-1-1 section numbers are shown in parentheses).

12.1 Layout Plans (04.A.01)

12.1.01 The site layouts are provided in Appendix B of the Work Plan. Subchapter 12.6 provides a discussion of access and haul roads.

12.1.02 The support zone will be used as the staging area for site operations and for other support functions required to maintain smooth operations on site. The support zone includes the change area, the lunch and break areas, and the supply storage areas. The support zone is designated as the tobacco product use and the eating and drinking area.

12.1.03 The work zone will be the area where actual site activities are conducted. Non-qualified personnel entering the work zone will be escorted by qualified personnel at all times. Site security will be maintained during working hours by the UXOQC/SO, who will ensure that the only personnel entering a given work zone are those who are wearing the proper PPE and have been trained and medically cleared to enter the area. The UXOQC/SO will also ensure that all other health and safety precautions are in place prior to entry by site personnel.

12.2 Emergency Response Plans

12.2.01 Emergency situations can be minimized through the proper implementation of the procedures in this subchapter. If an emergency situation develops, the UXOQC/SO will act as the on-scene incident commander. Emergency situations will be handled in a calm and deliberate manner so that the situation is controlled and the safety and health of the site workers and surrounding communities are not jeopardized.

12.2.02 The emergency shall be reported to the UXOQC/SO. The UXOQC/SO will call for assistance and describe the situation to emergency response personnel. After executing the necessary phone calls for emergency response, the UXOQC/SO will notify the contracting officer’s representative and the EEG project manager.

12.2.1 Procedures and Tests (01.E.01)

12.2.1.1 Emergency Response Plan Procedures

12.2.1.1.01 Evacuation routes, assembly points, site control points, and the hospital route map and emergency telephone numbers (see Subchapter 12.2.4) will be posted at the site. Hospital route maps shall also be maintained in the designated emergency location as well as in all site vehicles and work areas. All personnel will be aware of the location of the closest telephone access. Each UXO team will have communication access to the UXOQC/SO. The list of the emergency telephone numbers shall be readily available to all employees on the job site, and all numbers shall be able to be reached via cellular phone.

12.2.1.1.02 An air horn will be carried by each work team and one kept at the support zone. One long blast on the air horn will be the signal to evacuate the site immediately. Personnel in the exclusion zone will evacuate to the assembly point specified during the tailgate safety briefing. Once all personnel are accounted for, the UXOQC/SO will outline the actions to be taken as determined by the situation. Two short blasts on the air horn is the all clear signal.

12.2.1.1.03 No one will attempt emergency response or rescue until the situation has been assessed and the appropriate response outlined by the UXOQC/SO. **Table 12-1** lists activities that may be included in response or rescue. Some activities may be conducted concurrently.

Table 12-1. Potential Rescue Response Activities

Activity	Description
Buddy system	Allow no one to enter a contaminated area or hazardous area without a partner. Personnel in the exclusion zone should be in line of sight or communications contact with the supervisor or designated appointee at all times.
Casualty assessment	Survey casualties.
	Locate all victims and assess their condition.
	Determine resources needed for stabilization and transport.
Hazard assessment	Assess existing and potential hazards to site personnel and the off-site population.
	Determine whether and how to respond.
	Evaluate the need for evacuation of site personnel and off-site population.
	Evaluate the resources needed for evacuation and response.
Request aid	Contact the required off- or on-site personnel or facilities, such as the ambulance, fire department, police, etc. (see Table 12-3).
Allocate resources	Allocate on-site personnel and equipment to rescue and initiate incident response operations.
Control	Assist in bringing the hazardous situation under complete or temporary control and use measures to prevent the spread of the emergency (e.g., cover hole with tarp or plastic or wood, control fire, and secure site).

Activity	Description
Extricate	Remove or assist victims from the area.
Stabilize	Administer any medical procedures that are necessary before the victims can be moved. Stabilize or permanently fix the hazardous condition. Attend to what caused the emergency and anything damaged or endangered by the emergency (e.g., drums and tanks).
Transport	No one will be transported without any required decontamination. Take measures to minimize chemical contamination of the transport vehicle, ambulance, and hospital personnel.
Casualty logging	Record victim's name, time, destination, and victim's condition at transport.
Casualty tracking	Record disposition, condition, and location.

12.2.1.2 Emergency Equipment

12.2.1.2.01 Emergency equipment will be maintained in proper working order and checked daily for completeness during the site work. **Table 12-2** lists the type and location of emergency equipment that will be on site.

Table 12-2. On-Site Emergency Equipment

Equipment	Quantity	Location	Operation
First aid / burn kit	3	Support vehicles / support zone	All
Portable eye wash	3	Support vehicles / support zone	All
CPR pocket mask	1	Support vehicles / support zone	All
Air horn	3	Support zone / work zone	All
Fire extinguisher	2	Support vehicles / work zone	All

12.2.1.2.02 In addition to the equipment above, a cellular telephone will be located in a designated support zone and verified to be in working order prior to start of work.

12.2.1.3 First-Aid Procedures

The following first-aid procedures will be followed when on-site first-aid personnel must render assistance for individuals injured on site.

- For minor injuries, use routine first-aid procedures.
- For major injuries, call an ambulance immediately and administer the appropriate first-aid while awaiting arrival of the ambulance.
- Use Red Cross-approved measures for first-aid treatment.
- Wash or rinse affected area thoroughly with copious amounts of soap and water, then provide appropriate medical attention if required.

- If chemicals have been splashed into the eyes, rinse eyes for at least 15 minutes.
- If illness or injury involves the inhalation of hazardous materials, move victim to fresh air and, if necessary, decontaminate and transport to hospital.
- For any injury or illness involving exposure to hazardous chemicals, decontaminate the victim and transport to the hospital for professional medical attention.
- The UXOQC/SO will provide personnel data sheets to appropriate medical personnel as requested.

12.2.1.4 First-Aid Kits

The size and number of kits, which include first aid and eye wash supplies and a CPR mask, will be sufficient to accommodate the maximum number of people (including government personnel and visitors) on site at any given time. The kits will be located at each work site and the location will be made known to all personnel. An additional kit will be kept with the designated first-aid/CPR attendant or with the UXOQC/SO. Kit locations will be provided with adequate water and other supplies necessary to clean burns, wounds, or lesions.

12.2.1.5 Emergency Response Plan Testing

The emergency response plan shall be tested prior to commencing site operations to ensure its adequacy. This test shall include a person with simulated injury who is transported to the supporting medical facility.

12.2.2 Chemical Spill and Discharge Containment Plan (01.E.01, 06.A.02)

The immediate containment of spilled hazardous materials is required to minimize the impact on human and environmental health. This plan provides the methods and activities to protect the environment in case of a hazardous material spill.

12.2.2.1 Planning

Planning ensures the proper response to any emergency, including a chemical spill. To properly plan a response, it is important to identify the response team members, their response roles, the potential chemicals involved, the potential pathways of the hazardous materials into the environment, and the properties of the hazardous material.

12.2.2.2 Spill Prevention

Prevention is the best method of controlling the potential effects of hazardous materials on the environment. The most important aspects of prevention are training and communication. Should a

spill occur, properly trained personnel will be able to react to the spill and know what actions to take to protect human health and the environment. Communication includes marking all drums or containers with the contents, the associated hazards of the hazardous material, and the hazard rating. Information from material safety data sheets (MSDSs) for any chemicals brought on site are available and should be used in the event of a spill.

12.2.2.3 Spill Action Control Plan

12.2.2.3.01 In the event of a large spill or discharge, the contracting officer's representative, EEG's QC manager and health and safety director, and any appropriate government agency will be notified within 48 hours of the spill. Measures to control and contain the spill will be implemented immediately. The measures to be taken in the event of a spill include but are not limited to the following.

- Isolate and contain the source.
- Deny entry to unauthorized personnel.
- Place the control station upwind and keep out of low-lying areas.
- Keep combustibles and reactive materials away from the spill.
- Place contaminated solid materials into sealable containers in a manner that would prevent leakage of the contaminated materials.
- Contain liquid materials by damming with a boom or using a non-combustible absorbent. The absorbent material will then be placed into a sealable container for characterization and disposal.
- Place excavated soil either in a sealable container (small quantities) or in a plastic-lined and bermed stockpile. The stockpile will be covered with plastic.

12.2.2.3.02 Site operations should not involve handling large containers of hazardous materials that could easily be spilled; however, small containers (5 gallons or less) of gasoline, solvent, or diesel fuel may be used and stored on site. Only portable industrial-use gasoline containers approved by OSHA shall be used. No standard plastic containers shall be used. If material from these containers is spilled, the following steps will be taken.

- Evacuate the immediate area and extinguish ignition sources.
- The UXOQC/SO will evaluate the situation to ensure it is safe for personnel to begin cleanup operations.

- Using non-sparking or appropriately grounded tools, collect the contaminated soil and place it in a plastic bag, which will then be placed in a 55-gallon Department of Transportation (DOT)-approved drum.
- The UXOQC/SO will notify the appropriate USACE site representative that the spill occurred and await guidance on disposal of the drummed contaminants.

12.2.3 Firefighting Plan (01.E.01, 19.A.04)

12.2.3.1 Fire Extinguishers

A dry chemical type 4A:20B:C fire extinguisher will be available at each work site. Dry chemical fire extinguishers will be provided at any other site location where flammable materials may present a fire risk. Additionally, a fire extinguisher rated at least 1A:10B:C will be located with each piece of heavy equipment and in each site vehicle.

12.2.3.2 Small Fires

A small fire is defined as a fire that can be extinguished with a type 4A:20B:C fire extinguisher. In the event of a small fire, site personnel will:

- Evacuate all unnecessary personnel from the area, preferably to an upwind location.
- Attempt to extinguish fire using portable fire extinguishers or by smothering from an upwind location. (**Note:** Do not attempt to extinguish a fire involving explosives or explosive liquids.)
- Request emergency response assistance (i.e., ambulance, fire, and police), as needed, for any injuries or exposures to hazardous chemicals.

12.2.3.3 Large Fires

In the event of a large fire, or a small fire that cannot be extinguished, the following actions will be taken.

- Evacuate all unnecessary personnel from the site, preferably to an upwind location.
- Notify the fire department or other emergency response service (i.e., police, fire, ambulance, and hospital), as needed.
- Advise local fire department personnel as required.

12.2.3.4 Explosion

In the event of an explosion, all non-essential personnel will evacuate the site, required support equipment and personnel will be requested, and the CEHNC representative will be notified.

12.2.4 Posting of Emergency Telephone Numbers (01.E.05)

The list of the emergency phone numbers (**Table 12-3**) will be readily available to all employees on the job site, and all phone numbers will be able to be reached via cellular phone. All personnel will be aware of the location of the closest telephone access.

Table 12-3. Emergency Telephone Numbers

Agency or Facility	Personnel	Telephone Number
Coast Guard	Duty Officer	(787) 729-2301
Municipality of Culebra Police	Duty Officer	(787) 742-3501/0106
Culebra Medical Clinic	Duty Officer	(787) 742-3511
San Pablo del Este Hospital, Fajardo	Duty Staff	(787) 863-0505 (main), ext. 1141 (emergency)
		(787) 740-0333 (direct emergency number)
Municipality of Culebra Fire Department	Duty Officer	(787) 742-3530
Cuerpo de Vigilantes	Duty Officer	(787)742-0720
EEG Project Manager / Health & Safety Director	Mark Bagel	(352) 332-3888
USACE Jacksonville Project Manager	Ricardo Vasquez	(904) 232-1649
USACE Huntsville Project Manager	Brendan Slater	(256) 895-1507
Poison Control Center	Duty Officer	(800) 282-3171
National Response Center	Duty Officer	(800) 424-8802
Centers for Disease Control, Atlanta, GA	Duty Officer	(800) 232-0124

12.2.5 Man Overboard / Abandon Ship (19.A.04)

Transport by boat will be required for clearance operations on Isla Culebrita and additional cays that are accessible only via boat. All employees working on or near the water will wear a USCG-certified personal flotation device (PFD) all times and will use additional PPE such as lanyards and/or safety nets as necessary. Throwable devices must be immediately available for use. Requirements for PFD use are as follows.

- Wearable PFDs must be readily accessible.
- PFDs must be able to be put on in a reasonable amount of time in an emergency (vessel sinking, on fire, etc.).
- PFDs should not be stowed in plastic bags or in locked or closed compartments, or have other gear stowed on top of them.

12.2.5.1 Man Overboard

12.2.5.1.01 All personnel should know what to do if they fall overboard and what action the ship will take to rescue someone in the water. If a person falls overboard, depending on the temperature of the water, hypothermia can set in rapidly. Precautionary measures will be taken to help slow down loss of body heat, including staying calm in the water, tucking legs into the upper body, and keeping the head above water.

12.2.5.1.02 If a man overboard is observed, the following procedures apply.

- Shout out "Man overboard, port or starboard side."
- Throw life rings, life jackets, or any floating gear over the side as near a possible to the person.
- Make sure that the captain is notified by the quickest means possible.
- Make sure that you or a crew member keeps an eye on the person at all times and points to the person with an extended arm. This is so you do not lose track of the person and so the captain can use your extended arm as a reference point to maneuver the ship for recovery. If you have a vital man overboard station, then go to your station when you are relieved from keeping track of the person in the water.

12.2.5.2 Abandon Ship

12.2.5.2.01 EEG personnel shall:

- Fall in at your station as quickly as possible, in a military manner, observing traffic routes.
- Don survival suits (if applicable) and secure them properly.
- Remember the bearing and distance to the nearest land.
- Stay together with your group.

12.2.5.2.02 When orders are given to abandon ship, the following procedures apply.

- When the order "All hands make preparations to abandon ship" is given, proceed topside and put on a survival suit.
- Personnel in charge of life raft stations will direct the release and lowering of boats, rafts, nets, and ladders.
- If time permits, all hands should throw anything that floats over the side.
- Proceed over the side in an orderly manner.

- Enter the water on the windward side. This will cause the ship and debris in the water to drift away from you.
- Use lines, ladders, hoses, or debarkation nets to lower yourself into the water. Jumping into the water should be the last resort.
- Wear a soft hat, shoes, and full uniform with a long sleeve shirt, if possible, for protection.

12.2.5.2.1 Survival in the Water

- Stay approximately 200 yards from the ship. This distance will provide safety form suction, debris, and any underwater explosions that may occur.
- Temporary flotation can be provided by inflating your trousers, shirt, or even a pillow case.
- It is common belief that someone dressed in heavy clothing or waders will sink immediately if they fall overboard. This is not true. Air trapped in clothing provides considerable flotation, and bending the knees will trap air in waders, providing additional flotation. To stay afloat follow these rules:
  —Remain calm, do not thrash about or try to remove clothing or footwear. This leads to exhaustion and increases the loss of air that keeps you afloat.
  —Keep your PFD on.
  —Keep your knees bent.
  —Float on your back and paddle slowly to safety.
- Stay in a group, huddled together.
- To prevent shark attack, remain calm and remove jewelry.

12.2.5.2.2 Survival in a Life Raft

- Wounded and sick personnel have priority in the rafts.
- Redistribute the load in each raft if necessary. Rescue chances will be improved if the rafts stay together.
- Fresh water will be given only after the first 24 hours. Do not drink salt water.
- A strong desire or will to live and staying calm will increase your chances of survival.

12.2.5.2.3 Techniques for Attracting Other Vessels and Aircraft

- Pyrotechnics are provided for day and night use. Follow the instructions found on the labels. Release the pyrotechnic with the wind at your back and your arm extended away

from the raft at a 45-degree angle. If a pyrotechnic device fails to fire, attempt to discharge it one more time. If it fails again, dispose of the cartridge overboard.

- Some other items provided are a signal mirror, dye markers, smoke flares, flashlights, and police whistles.

12.3 Hazard Communication Program (01.B.06)

12.3.01 EEG recognizes the importance of documentation, inventory, labeling, and training with regard to chemicals brought onto job sites. The purpose of EEG's Hazard Communication Program is to evaluate the potential hazards associated with chemicals and to communicate this information to site workers as required under 29 CFR 1926.59.

12.3.02 Subcontractors are responsible for providing their own program, which must meet or exceed the requirements set forth in EEG's program, or must use EEG's program. Subcontractors are required to submit a copy of their program to EEG upon request. Subcontractors are required to provide a list of chemicals and submit this list along with appropriate MSDSs to the UXOQC/SO prior to beginning work on a project. In addition, subcontractors are required to update and resubmit this list whenever a new chemical is brought onto the project site.

12.4 Critical Lift Procedures (16.C.18)

Care must be taken in lifting and handling heavy or bulky items because they are the cause of many joint and back injuries. The following fundamentals address the proper lifting of materials to avoid joint and back injuries.

- The size, shape, and weight of the object to be lifted must be considered.
- Site personnel will not lift more than they can handle comfortably.
- Individual workers should not normally lift loads in excess of 40 pounds.
- A firm grip on the object is essential; therefore, the hands and object shall be free of oil, grease, and water, which might prevent a firm grip.
- The hands and fingers shall be kept away from any points that cause them to be pinched or crushed, especially when setting the object down.
- The item shall be inspected for metal slivers, jagged edges, burrs, rough or slippery surfaces, and pinch points, and gloves shall be used, if necessary, to protect the hands.
- The feet shall be placed far enough apart for good balance and stability; Personnel will ensure that solid footing is available prior to lifting the object.

- Personnel shall get as close to the load as possible and bend the legs at the knees, making sure to keep the back as straight as possible. To lift the object, the legs are straightened from their bending position.
- Personnel shall not carry a load that cannot be seen over or around.
- When placing an object down, the stance and position are identical to that for lifting, with the back kept straight and the legs bent at the knees.
- When two or more people are required to handle an object, coordination is essential to ensure that the load is lifted uniformly and that the weight is equally divided between the individuals carrying the load.
- When carrying the object, each person, if possible, shall face the direction in which the object is being carried.

12.5 Contingency Plan for Severe Weather (19.A.03)

Severe weather, including thunderstorms and associated lightning as well as hurricanes, is a common feature of the region; therefore, meteorological conditions will be closely watched. A weather radio will be used on site to monitor for severe weather conditions. Thunderstorms often occur late in the afternoon on hot days, but they can occur at any time of the day and in any season of the year. A severe thunderstorm or tornado watch announcement on the radio or television indicates that a severe thunderstorm or tornado is possible. Work will continue at the work site during the watches. A severe thunderstorm or tornado warning signifies that a severe thunderstorm or a tornado has been sighted or detected by radar and may be approaching. All on-site work will cease during a thunderstorm, severe thunderstorm warning, or tornado warning. **Table 12-4** defines severe weather watches and warnings.

Table 12-4. Severe Weather Watches and Warnings

Weather Event	Watch	Warning
Tornado	Conditions are conducive to the development of tornadoes in and close to the watch area.	A tornado has actually been sighted by spotters or indicated on radar and is occurring or imminent in the warning area.
Severe thunderstorm	Conditions are conducive to the development of severe thunderstorms in and close to the watch area.	A severe thunderstorm has actually been observed by spotters or indicated on radar, and is occurring or imminent in the warning area.
Tropical storm	Tropical storm conditions with sustained winds from 39 to 73 miles per hour (mph) are possible in the watch area within the next 36 hours.	Tropical storm conditions are expected in the warning area within the next 24 hours.
Hurricane	Hurricane conditions (sustained winds greater than 73 mph) are possible in the watch area within 36 hours.	Hurricane conditions are expected in the warning area in 24 hours or less.

12.5.1 Weather Monitoring

12.5.1.01 In the event of inclement weather, electrical storms, hurricanes, or extremely hot weather, it may be necessary to cease operations and evacuate the site. The UXOQC/SO and the site manager will be responsible for monitoring the National Oceanic and Atmospheric Administration (NOAA) weather radio on a daily basis and advising site personnel of the forecast. A 300-watt NOAA weather radio transmitter (Weather Radio Station WNJ-693) installed at Mt. Flamenco on Culebra broadcasts on a frequency of 162.450 megahertz. In the event of adverse weather, the UXOQC/SO will determine if work can continue without sacrificing the health and safety of site personnel. Items to be considered in determining whether would should continue include:

- Heavy rainfall
- Electrical storms
- Potential for heat stress
- Potential for accidents
- Approaching hurricanes
- Malfunctioning of monitoring equipment
- Limited visibility

12.5.1.02 Forecasts will also be monitored on the Internet by reviewing the daily forecasts at NOAA National Hurricane Center (http://www.nhc.noaa.gov/); the NOAA National Weather Forecast Office, San Juan (http://www.srh.noaa.gov/sju/); or the Caribbean Hurricane Network (http://stormcarib.com/).

12.5.1.03 Significant weather forecasts will be presented and discussed at the daily morning safety briefing and an appropriate course of action implemented. Because Culebra is relatively isolated, it may be necessary to commence preparations for significant tropical events well in advance of 72 hours out.

12.5.2 Hurricane and Tropical Storm Readiness

12.5.2.01 The hurricane season for the Puerto Rico and Culebra area is June 1 through November 30. The period of greatest frequency and severity of tropical storms is typically September and October. Fajardo, Puerto Rico, the closest area on the mainland from Culebra, is on average brushed or hit every 3.62 years, with an average of a direct hurricane hit every 11.6 years.

12.5.2.02 Maintaining an adequate state of readiness requires, at a minimum, *continuous* good housekeeping at the work site, proper material storage, tie-down provisions for office trailers, sheds, etc., and other measures as may be appropriate to the particular nature of the contract work. Throughout the *entire* hurricane season, all work, including material storage, placement of construction debris, and management of the work, will be performed in such a manner as to allow personnel to rapidly achieve the hurricane condition of readiness required.

12.5.2.1 Hurricane Categories

12.5.2.1.01 The intensity of a land-falling hurricane is expressed in terms of categories that relate wind speeds and potential damage. **Table 12-5** presents hurricane categories as rated on the Saffir-Simpson scale.

Table 12-5. Hurricane Categories

Category	Wind Speed	Potential Damage
Category 1	74 to 95 mph (64 to 82 knots)	No real damage to buildings. Damage to unanchored mobile homes. Some damage to poorly constructed signs. Some coastal flooding and minor pier damage.
Category 2	96 to 110 mph (83 to 95 knots)	Some damage to building roofs, doors and windows. Considerable damage to mobile homes. Flooding damages piers and small craft in unprotected moorings may break their moorings. Some trees blown down.
Category 3	111 to 130 mph (96 to 113 knots)	Some structural damage to small residences and utility buildings. Large trees blown down. Mobile homes and poorly built signs destroyed. Flooding near the coast destroys smaller structures with larger structures damaged by floating debris. Terrain may be flooded well inland.
Category 4	131 to 155 mph (114 to 135 knots)	More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland.
Category 5	156 mph and up (135+ knots)	Complete roof failure on many residences and industrial buildings. Some complete building failures, with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required.

12.5.2.1.02 Typical hurricanes are about 300 miles wide although they can vary considerably. Size is not necessarily an indication of hurricane intensity, and focus should not be on the location and track of the center, because a hurricane's destructive winds and rains cover a wide swath. Hurricane-force winds can extend outward to about 25 miles from the storm center of a small hurricane and to more than 150 miles for a large one. The area over which tropical storm-force winds occur is even greater, ranging as far out as almost 300 miles from the eye of a large hurricane.

12.5.2.1.03 The main hazards associated with tropical cyclones and especially hurricanes are storm surge, high winds, heavy rain, and flooding, as well as tornadoes. The intensity of a hurricane is an indicator of damage potential; however, impacts are a function of where and when the storm strikes.

12.5.3 Evacuation Plan

12.5.3.01 The site manager and the UXOQC/SO will track the approach of severe storms. Once an oncoming tropical depression is indicated, the site manager will notify the project manager of this condition. The UXOQC/SO will coordinate with the local Civil Defense personnel to determine which shelters the team may be able to occupy should an evacuation order be issued.

12.5.3.02 If the tropical depression reaches tropical storm strength, EEG project manager will notify the CEHNC project manager concerning the potential of shutdown due to the storm. The EEG project manager will provide the CEHNC project manager with an evaluation of the conditions and the potential costs in terms of time and budget to demobilize or stay, based on the strength of the storm and damage potential to the island. A decision to stay or leave the site must be made within three days of projected landfall if full evacuation from Puerto Rico is suggested.

12.5.3.03 The EEG UXOQC/SO and the site manager will determine and declare the hurricane condition and begin implementation of the following schedule (the conditions are based on DoD facility guidance).

12.5.3.1 Seasonal Condition

This condition is a normal condition of alertness, consistent with the dictates of sound precautionary measures to be exercised during the hurricane season (June 1 to November 30). This condition will be effective throughout the hurricane season.

12.5.3.2 Hurricane Condition IV

Trend indicates a possible threat of destructive winds of force indicated within 72 hours. Personnel must have on the job site sufficient hurricane gear such as ropes, stakes, and tarpaulins to securely fasten all stockpiles of materials, tools, and equipment. The site shall be cleared of all waste material that may become windborne. All trash and debris must be immediately removed from the site.

12.5.3.3 Hurricane Condition III

Destructive winds in excess of 64 knots or greater associated with a tropical system are anticipated within 48 hours. Personnel will remove or store unnecessary materials and will check to make sure that sufficient hurricane gear is on hand so that every item or materials that could become windborne can be securely tied down on short notice. When an island or installation is put under a hurricane watch or DoD Condition III level (destructive winds possible within 48 hours), EEG will begin hurricane preparations.

12.5.3.4 Hurricane Condition II

Destructive winds in excess of 64 knots or greater associated with a tropical system are anticipated within 24 hours. EEG personnel will make such preparations as will enable all work to be completely secured within 12 hours. All materials not immediately required shall be removed or securely tied down. All openings shall be closed except those necessary to permit access to the work currently under way. All trash and debris shall be removed or stored on site. Work will continue until directed by the site manager to secure the site.

12.5.3.5 Hurricane Condition I

12.5.3.5.01 Destructive winds in excess of 64 knots or greater associated with a tropical system are anticipated within 12 hours. EEG personnel will evacuate the site and take all possible precautions to safeguard personnel, project records, and property. The UXOQC/SO will order the complete security of the contract work when the hurricane is expected to reach the local area within 12 hours. When the UXOQC/SO orders “complete security,” all work will stop and personnel will completely secure the project. All project personnel will secure material that may become windborne or dispersed by high winds. Buildings, structures, or portions thereof shall be braced where necessary, and openings closed will be closed.

12.5.3.5.02 At minimum, the following items should be taken when evacuating:

- Prescription medications and medical supplies
- Bedding and clothing, including sleeping bags and pillows
- Bottled water, battery-operated radio and extra batteries, first aid kit, flashlight
- Important project documents and data

12.6 Access and Haul Road Plan (8.D.1)

12.6.01 Cerro Balcon (OOU-3) is located on private agricultural land in the interior of the Island of Culebra. Rights of entry to conduct the surface clearance operations must be obtained prior to site work. A private, gated, dirt road runs into the site from the paved public access road. All staging will be conducted from inside the gate along the side of the dirt road. This dirt road will be used for all site ingress and egress.

12.6.02 Isla Culebrita (OOU-4) and the additional cays (OOU-5) are administered by FWS and are accessible only by boat. No heavy equipment or vehicles will be utilized on these sites. All equipment will necessarily be carried in by hand. All access points and travel paths will be determined following the site visit and in consultation with FWS.

12.7 Safety and Health Plan (28.A.02)

See the Site-Specific Health and Safety Plan for this project (Attachment A).

12.8 Blasting Plan (29.A.01)

Elements of the Blasting Plan are discussed in Chapters 3 and 4 of the Work Plan.

12.9 Plan for Prevention of Alcohol and Drug Abuse (DFARS Subpart 252.223-7004)

12.9.1 Purpose

12.9.1.01 EEG recognizes the dangers that the abuse of alcohol and/or drugs can have on the performance of its employees and on the safety and security of its work environment. EEG will therefore test, at its expense, all newly hired employees for drug and/or alcohol use as outlined in this plan. Further, EEG will test, at company expense, any current employees for drug or alcohol use if a reasonable suspicion exists that the employee is in violation of this plan, as a regular part of fitness for duty examinations, after a work-related injury, and as a follow-up procedure to any drug or alcohol treatment program. If an employee receives a positive result, that employee may be subject to discipline up to and including termination of employment. All drug testing will conform to the requirements of this plan and to state and federal law.

12.9.1.02 EEG recognizes that drug and/or alcohol abuse (substance abuse) is treatable and is committed to making an effort to assist current employees who may be experiencing problems due to substance abuse, by helping them to understand and correct it, while supporting approved rehabilitation efforts.

12.9.1.03 Additionally, under Public Law 100-690, Title V, in conjunction with the Drug Free Workplace Act of 1988 and/or in compliance with the Drug Free Workplace, State of Florida Workers' Compensation Act 59A-24.003(7) FAC [Florida Administrative Code], Section 112.0455(13), and 440.102, FS [Florida Statue], and/or in compliance with the DOT regulations in this industry, EEG is obligated to establish and communicate its policy on drug and alcohol use to all employees.

12.9.2 Policy

12.9.2.1 Condition of Employment and/or Continued Employment

It is EEG's policy to maintain a drug-free workplace as a condition of employment and/or continued employment. All employees must abide by the terms of this policy.

12.9.2.2 Drug and/or Alcohol Use Prohibitions

The use, sale, manufacture, distribution, purchase, possession, dispensing, or being under the influence of illegal drugs, non-prescribed controlled substances, or alcohol on company property, while on company business, or while operating a company-owned or leased vehicle is strictly prohibited. Employees found to be in violation of this policy will be subject to discipline up to and including termination of employment. Any illegal drugs found on company property will be turned over to the appropriate law enforcement authorities.

12.9.2.3 Testing

In order to detect the use of these substances, as described above, employees may be directed to submit to a urinalysis drug test, a blood test, and/or breath test. Individuals under the influence of alcohol or with illegal or non-prescribed controlled drugs in their system are in violation of this policy and will be subject to discipline up to and including termination of employment.

12.10 Fall Protection Plan (Section 21)

Personal fall protection devices shall be utilized at all times when an individual is elevated above 6 feet or more above the ground level. Personal fall arrest systems shall be required when working on steep slopes. Fall protection shall comply with American National Standards Institute (ANSI) A10.14.

12.10.1 Working Over or Near Water (CFR 1926.106)

12.10.1.01 Employees working over or near water where the danger of drowning exists shall be provided with USCG-approved life jackets or buoyant work vests. Before and after each use, the buoyant work vests or life preservers shall be inspected for defects that would alter their strength or buoyancy. Defective units shall not be used.

12.10.1.02 Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed 200 feet.

12.10.1.03 At least one lifesaving skiff shall be immediately available at locations where employees are working over or adjacent to water.

12.11 Site Sanitation Plan (Section 02)

See the Site-Specific Health and Safety Plan (Attachment A).

12.12 Fire Prevention Plan (09.A.01)

See the Site-Specific Health and Safety Plan (Attachment A).

13.0 Site-Specific Hazards and Controls

13.0.01 For each type of activity that will be performed on this project, an activity hazard analysis has been performed and Certification of Activity Hazard Analysis form completed to provide a task-specific evaluation of the known or potential hazards associated with the conduct of the individual activity. The UXOQC/SO will use these forms daily to inform site personnel of the hazards expected during the day's activities.

13.0.02 The completed Certification of Activity Hazard Analysis form also outlines the engineering and administrative controls, operating procedures or programs, and PPE that will be required for the safe conduct of the particular activity.

13.0.03 The hazard analyses have been conducted using the best available information related to the site and the nature of the task itself. If site conditions or tasks change, the UXOQC/SO will evaluate the new condition or task and complete a new Certification of Activity Hazard Analysis form. The UXOQC/SO will then forward the form to the EEG certified industrial hygienist (CIH) for approval prior to resuming or initiating the task.

Table 13-1. Activity Hazard Analysis

ACTIVITY: Location Survey, and Mapping **ANALYZED BY/DATE:** MGB 4/16/05

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
1. Cutting vegetation for line of site. 2. Use of global positioning system (GPS) or conventional survey equipment to locate boundaries. 3. Installation of control point (rods) and corner stakes.	1. Physical exertion. 2. Heat stress. 3. Slip, trip, or fall. 4. Poisonous plants. 5. Poisonous/hazardous animals. 6. MEC 7. Chemical hazard – low. 8. Physical hazard – low. 9. Hand or power tools. 10. Puncture or laceration.	1. Drink plenty of liquids. 2. A qualified UXO technician will perform MEC avoidance. 3. Site personnel will remain aware of the potential for injury from contact with the stumps of small trees and bushes with thorns. 4. Electromagnetic survey for surface items. 5. Visual inspection for MEC, use of electromagnetic device prior to potential intrusive activities (i.e., pounding stakes). 6. Wear the correct shoes for weather conditions (i.e., mud, rain, uneven surfaces). 7. Keep area clear of clutter. 8. Carry small instead of large loads.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
1. Level D protection. 2. Leather gloves. 3. Safety glasses required if an eye hazard exists. 4. Leather high boots are adequate. 5. Electromagnetic sensors. 6. Hammer. 7. Machete or weed eater with blade.	1. Inspect for safety of operations. 2. Inspect blades for sharpness and/or damage. 3. Ensure that all guards are present on power tools. 4. Inspect area prior to driving stakes.	1. Tailgate safety briefing. 2. Site-specific safety indoctrination. 3. UXO-trained personnel will supervise this activity.

Table 13-1. Activity Hazard Analysis (continued)

ACTIVITY: Vegetation Clearing using Chain Saw or Bladed Weed Eater **ANALYZED BY/DATE:** MGB 4/16/05

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
1. Fuel equipment. 2. Start equipment. 3. Safety spotter to watch for hazards. 4. Cut vegetation. 5. Move vegetation off work site.	1. Physical exertion. 2. Heat stress. 3. Fire hazards (flammable materials). 4. Lifting hazards. 5. Slip, trip, or fall. 6. High noise (greater than 85 dBA). 7. Poisonous plants. 8. Poisonous or hazardous animals. 9. Hand or power tools. 10. MEC. 11. Puncture or laceration.	1. Safe work practices 2. PPE for chain saw and weed eater. 3. Site control zones. 4. Electromagnetic survey for surface items. 5. Applicable machine guards will be in place. 6. EOD-trained personnel on site to identify potential MEC items. 7. Wear the correct shoes for weather conditions (i.e. mud, rain, uneven surfaces). 8. Reduce clutter as possible. 9. Carry small instead of large loads.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
1. Level-D protection modified by the mandatory addition of ear plugs or muffs and wire mesh face shields. 2. Leather gloves. 3. Hard hat when cutting vegetation and limbs. 4. Composite-toed boots. 5. Steel-toe/metatarsal covers used with approval of UXOQC/SO. 6. Kevlar leg chaps. 7. Bobcat or Bulldozer may be used to remove vegetation. 8. Chain saw. 9. Bladed weed eater.	1. Safety inspection by UXOQC/SO. 2. Periodically inspect blades for sharpness and/or damage. 3. Inspect area for MEC.	1. Site-specific safety indoctrination for all personnel. 2. UXO-trained personnel will supervise this activity 3. All vegetation clearance personnel will have HAZWOPER training. 4. Tailgate safety briefing.

Table 13-1. Activity Hazard Analysis (continued)

ACTIVITY: Electromagnetic Assisted Visual Clearance **ANALYZED BY/DATE:** MGB 5/16/05

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
1. Check equipment to a known source. 2. Walk grid and work area in lanes 5 feet apart, swinging the electromagnetic sensor in a minimal 5-foot arc less than 6 inches from the ground. 3. Place and mark MEC with flags as necessary.	1. Physical exertion. 2. Heat stress. 3. Lifting hazard. 4. Slip, trip, or fall. 5. Poisonous or hazardous animals. 6. Poisonous plants. 7. MEC. 8. Puncture or laceration. 9. Chemical hazard – low. 10. Physical hazard – medium.	1. Safe work practices. 2. PPE. 3. Set up site control zones. 4. Electromagnetic survey. 5. Site personnel will remain aware of the potential for injury from contact with the stumps of small trees and bushes that have been grubbed. 6. Wear the correct shoes for weather conditions (i.e., mud, rain, uneven surfaces). 7. Keep area clear of clutter. 8. Carry small instead of large loads.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
1. Level D protection. 2. Company clothing. 3. Hard hats required if an overhead hazard exists. 4. Safety glasses required if an eye hazard exists. 5. Leather boots. 6. Composite-toed boots required if a crush hazard exists.	1. Inspect area for slip, trip, or biological hazards. 2. Inspect area for endangered species habitats.	1. Tailgate safety briefing. 2. Site-specific safety indoctrination. 3. UXO-trained personnel will supervise this activity. 4. HAZWOPER training.

Table 13-1. Activity Hazard Analysis (continued)

ACTIVITY: Intrusive Investigation of Partially Buried MEC **ANALYZED BY/DATE:** MGB 4/16/05

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
1. Carefully excavate around MEC. 2. Identify type and condition. 3. Document the location of MEC items by GPS or mapping. 4. Determine the condition and disposal method of item.	1. Physical exertion. 2. Heat stress. 3. Slip, trip, or fall 4. Intrusive activity (hand excavation of material potentially presenting an explosive hazard [MPPEH]). 5. Poisonous plants. 6. Poisonous or hazardous animals. 7. Hand or power tools. 8. MEC. 9. Chemical hazard – low. 10. Physical hazard – moderate.	1. Safe work practices. 2. PPE. 3. Site control zones. 4. Visual clearance. 5. Applicable programs: heat stress, hearing conservation, and the Accident Prevention Plan. 6. Wear the correct shoes for weather conditions (i.e., mud, rain, uneven surfaces). 7. Reduce clutter 8. Carry small instead of large loads. 9. If heavy equipment is being used, digging will not be allowed within 12 inches from MPPEH, and hand tools will be used to finish.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
1. Level D protection. 2. Company clothing. 3. Leather gloves. 4. Safety glasses required if an eye hazard exists. 5. Composite-toed leather boots. 6. Excavation tools (i.e., shovels, picks, rakes, and heavy equipment).	1. Inspect the condition of MEC and assess the hazard. 2. Inspect the area for hazards prior to work.	1. UXO technicians will be UXO-trained. 2. Tailgate safety briefing 3. All personnel will have site-specific safety indoctrination 4. Persons working with UXO will have HAZWOPER training. 5. Operator of heavy equipment will be trained to use that equipment.

Table 13-1. Activity Hazard Analysis (continued)

ACTIVITY: Heavy Equipment Operation (backhoe, Bobcat, and bulldozer) **ANALYZED BY/DATE:** MGB 4/16/05

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
1. Fueling the equipment. 2. Check equipment for proper safety equipment. 3. Excavate or move soil in shallow lifts. 4. Screen excavated area with geophysical locator to ensure that no MPPEH is detected. 5. When in motion, properly observe personnel in the area.	1. Crush hazard by heavy equipment. 2. Physical exertion. 3. Heat stress. 4. Slip, trip, or fall. 5. Intrusive activity (hand excavation of MPPEH). 6. Poisonous plants. 7. Poisonous or hazardous animals. 8. MEC. 9. Chemical hazard – low. 10. Physical hazard – moderate.	1. Safe work practices. 2. PPE. 3. Site control zones. 4. Electromagnetic survey. 5. Visual clearance. 6. A spotter will be used to help locate personnel around the equipment while moving. 7. Applicable machine guards will be in place. 8. Shut down equipment or unit before refueling. 9. Clean the clutter from poor housekeeping.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
1. Bulldozer. 2. Backhoe. 3. Hand tools. 4. Level D protection. 5. Company clothing. 6. Leather gloves. 7. Safety glasses required if an eye hazard exists. 8. Composite-toed leather boots. 9. Hard hats when applicable.	1. Inspect equipment for safety function. 2. Inspect area of operation for hazards.	1. Operator will be properly trained to work equipment. 2. Personnel on site during excavation will be UXO-trained. 3. UXO-trained personnel will supervise this activity. 4. Site-specific safety indoctrination.

Table 13-1. Activity Hazard Analysis (continued)

ACTIVITY: Explosive Disposal of UXO **ANALYZED BY/DATE:** MGB 4/16/05

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
1. Transport explosives to the site. 2. Attach explosives in a manner that will detonate or explosively vent the item. 3. Tamp the item with sandbags to limit the noise and fragments produced. 4. Check area for unauthorized personnel, boats, or aircraft within specified distance from the demolition area. 5. Warn personnel in area prior to detonating explosives 6. Detonate explosives.	1. Physical exertion. 2. Heat stress. 3. Heavy equipment. 4. Fire hazards (explosive materials). 5. Lifting hazards. 6. Slip, trip, or fall. 7. Intrusive activity (soil excavation for demolition pit). 8. Poisonous plants. 9. Poisonous or hazardous animals. 10. MEC. 11. Explosive detonation.	1. Safe work practices. 2. PPE. 3. Site control zones. 4. Explosive items will be tamped with sand bags to reduce blast and noise hazards. 5. Vehicles not running, wheels chocked, brakes set when loading and unloading 6. Explosives covered with flame-resistant tarpaulin. 7. Vehicles have first aid kit, fire extinguisher (2 each @ 10BC), and communication capability on personnel. 8. Do not allow explosives to contact vehicle metal bed. 9. Licensed drivers will not exceed 25 mph off-road speeds. 10. Wear the correct shoes for weather conditions (i.e., mud, rain, uneven surfaces). 11. Clean the clutter from poor housekeeping. 12. Carry small instead of large loads. 13. Tamp shots whenever possible. 14. Wet ground prior to demolition operations.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
1. Level D protection. 2. Non-sparking tools. 3. Safety glasses required if an eye hazard exists. 4. Leather composite-toed boots if a crush hazard exists. 5. Dunnage, sand bags, wooden box, non-sparking bed liner, flame resistant tarp. 6. Water truck and/or centrifugal pump.	1. Inspect area for hazards prior to work. 2. Inspect MEC item to ensure that the explosives have been properly attached. 3. After detonation, inspect item to ensure that all explosive materials have been vented or the item is completely destroyed. 4. Inspect vehicles prior to explosive movement. 5. Ensure that personnel are not wearing clothing made of synthetic fiber that is static-producing.	1. Site-specific safety indoctrination. 2. Fully trained and qualified UXO technician will perform this task. 3. Tailgate safety briefing. 4. Demolition operations briefing. 5. HAZWOPER training. 6. Explosive detonation training.

Table 13-1. Activity Hazard Analysis (continued)

ACTIVITY: Bobcat-Mounted Bush Hog or Similar Equipment **ANALYZED BY/DATE:** MGB 4/16/05

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
1. Fueling the equipment. 2. Check equipment for proper safety. Set mower blade to minimum height of 12 inches. 3. Screen area where vegetation is cut prior to moving up vehicle. 4. When in motion, properly observe personnel in the area.	1. Crush hazard by heavy equipment. 2. Physical exertion. 3. Heat stress. 4. Slip, trip, or fall. 5. Poisonous plants. 6. Poisonous or hazardous animals. 7. MEC. 8. Chemical hazard – low. 9. Physical hazard – moderate.	1. Safe work practices. 2. PPE. 3. Site control zones. 4. Electromagnetic survey. 5. Visual clearance. 6. Site personnel will remain aware of the potential for injury from contact with the stumps of small trees and bushes that have been grubbed. 7. Applicable machine guards will be in place. 8. Limit mower to a minimum height of 12 inches above ground. 9. Shut down equipment or unit before refueling. 10. Wear the correct shoes for weather conditions (i.e., mud, rain, uneven surfaces). 11. Clean the clutter. 12. Carry small instead of large loads.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
1. Bush Hog. 2. Tractor. 3. Hand tools. 4. Level D protection. 5. Company clothing. 6. Leather gloves. 7. Safety glasses required if an eye hazard exists. 8. Composite-toed leather boots. 9. Hard hats if applicable.	1. Inspect equipment for safety function. 2. Inspect area of operation for hazards. 3. Inspect the blades for sharpness and/or damage.	1. Personnel will be properly trained to operate equipment. 2. UXO technician will supervise this activity. 3. Site-specific safety indoctrination.

Table 13-1. Activity Hazard Analysis (continued)

ACTIVITY: Scrap Handling and Removal **ANALYZED BY/DATE:** MGB 4/16/05

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
1. Fueling the equipment. 2. When in motion, properly observe personnel in the area. 3. Lifting scrap. 4. Filling and sealing drums. 5. Lifting drums with heavy equipment.	1. Fuel spill or fire. 2. Crush or pinch hazard while in motion or while moving drums. 3. Puncture from sharp pieces of fragments or plants. 4. Heat stress. 5. Physical exertion. 6. Slip, trip, or fall. 7. Poisonous or hazardous plants and animals. 8. Munitions debris. 9. Chemical hazard – low. 10. Physical hazard – moderate.	1. Have fuel spill equipment handy and do not fuel hot equipment. 2. Keep hands and feet from moving parts and from beneath drums. 3. Use of drum lifter to pick up drums. 4. Careful handling of sharp munitions debris fragments.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
1. Bobcat or backhoe. 2. Drum lifter. 3. Hand Tools 4. Level-D protection. 5. Leather gloves. 6. Safety glasses required if an eye hazard exists. 7. Steel or composite-toed leather boots. 8. Hard hats if applicable.	1. Inspect munitions debris for explosives. 2. Inspect safety devices on heavy equipment. 3. Ensure that drums are properly sealed and drum lifter is properly attached to heavy equipment.	1. Personnel will be properly trained to operate equipment. 2. UXO-trained personnel will supervise this activity. 3. Site-specific safety indoctrination.

Table 13-1. Activity Hazard Analysis (continued)

ACTIVITY: Transport by Boat to Cay Sites **ANALYZED BY/DATE:** MGB 4/16/05

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
1. Fueling the boat. 2. Loading and offloading of equipment. 3. Boat operations. 4. Use of docks. 5. Anchoring. 6. Safety support.	1. Fuel spill. 2. Slip, trip, and fall hazards due to wet decks and boat motion. 3. Crash into shallow reefs or bottom. 4. Slippery docks.	1. Have fuel spill equipment handy and do not fuel hot equipment. 2. Keep hands and feet from moving parts. 3. Use of lines to secure access to shore. 4. Keep boat pilot on boat in case of an emergency. 5. Obey buoys and carefully navigate shallow areas. 6. Use docks whenever possible. 7. Do not walk around boat while boat is in motion. 8. Use mooring buoys when available. 9. Do not go out if sea conditions are too rough.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
1. Boats. 2. Anchors. 3. Life jackets. 4. Marine radios.	1. Inspect propeller before leaving dock. 2. Monitor sea conditions.	1. Boat captain must be trained and certified. 2. Site-specific safety indoctrination.

14.0 References

14.0.01 EEG, 2005. Work Plan – Non-Time-Critical Removal Action at the Municipality of Culebra, Puerto Rico.

14.0.02 US Department of the Army, Accident Reporting and Records, AR 385-40, 01/11/94.

ATTACHMENT A

Site-Specific Health and Safety Plan

SSHSP Acknowledgment

Project: Non-Time-Critical Removal Action
Site: Municipality of Culebra, Puerto Rico
Project Number: 8003
Site Location: Culebra Island & Adjacent Cays
EEG Project Manager / Health and Safety Director: Mark Bagel, PG
Senior UXO Supervisor: Mike Zaloudek

I acknowledge that I understand the requirements of this SSHSP and agree to abide by the procedures and limitations specified. I also acknowledge that I have been given an opportunity to have my questions concerning the SSHSP and its requirements answered prior to performing field activities. Health and safety training and medical surveillance requirements applicable to my field activities at this site are current and will not expire during on-site activities.

Signature	Organization	Date	Social Security No.

Contents

Tables

Figures

Abbreviations & Acronyms

°C	degrees Celsius
°F	degrees Fahrenheit
ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
AR	Army Regulation
bpm	beats per minute
CDC	Centers for Disease Control
CEHNC	United States Army Engineering and Support Center
CIH	certified industrial hygienist
CFR	Code of Federal Regulations
CPR	cardiopulmonary resuscitation
CWM	chemical warfare materiel
dB(A)	decibels (A-weighted)
DHHS	Department of Health and Human Services
DoD	Department of Defense
DOT	Department of Transportation
EEG	Ellis Environmental Group, LC
EM	Engineer Manual
EOD	explosive ordnance disposal
EP	Engineer Pamphlet
EPA	Environmental Protection Plan
ER	Engineer Regulation
GFCI	ground fault circuit interrupter
HAZWOPER	hazardous waste operations and emergency training
HTRW	hazardous, toxic, and radioactive waste
LEL	lower explosive limit
mA	milliampere
MEC	munitions and explosives of concern
MSDS	material safety data sheet
NEC	National Electrical Code
NESC	National Electrical Safety Code
NIOSH	National Institute of Occupational Safety and Health
OHP	Occupational Health Program
OSHA	Occupational Safety and Health Administration
OT	oral temperature
PPE	personal protective equipment
SOW	Scope of Work
SSHSP	Site-Specific Health and Safety Plan
SUXOS	senior unexploded ordnance supervisor
SZ	support zone
TLV	threshold limit value

TWA	time-weighted average
UL	Underwriters Laboratories, Inc.
USACE	United States Army Corps of Engineers
UXO	unexploded ordnance
UXOQC/SO	unexploded ordnance quality control / safety officer
WBGT	wet bulb globe temperature
WZ	work zone

1.0 Introduction

1.0.01 This Site-Specific Health and Safety Plan (SSHSP) has been prepared by Ellis Environmental Group, LC (EEG) as an attachment to the Accident Prevention Plan (Appendix D of the Work Plan). Both documents are designed to anticipate, identify, evaluate, and control the safety and health hazards that may be encountered during this munitions and explosives of concern (MEC) removal action at the Cerro Balcon area on the Island of Culebra and on Isla Culebrita and additional cays. This SSHSP also describes the response procedures that will be implemented if an emergency arises during the conduct of the site tasks outlined in this document. Where the word "shall" is used, the provisions of the statement are mandatory.

1.0.02 The levels of personal protection and the procedures specified in this plan are based on the best available information from reference documents and current site data. These recommendations represent the minimum safety and health requirements to be observed by all personnel engaged in this project. Unforeseeable site conditions or changes in the Scope of Work (SOW) may warrant a reassessment of protection levels and stated controls. All adjustments to the SSHSP must have prior approval by the United States Army Engineering and Support Center (CEHNC) and EEG.

1.0.03 All EEG personnel involved in this project shall carefully read, understand, and comply with this document, and they should complete the acknowledgement form prior to starting work. All on-site personnel shall follow the designated safety and health procedures, be alert to the hazards associated with working on site, and exercise reasonable caution at all times.

1.0.04 MEC and hazardous waste pose a serious safety and health problem that endangers human and animal life and environmental quality. The regulations and guidelines listed below provide employers and employees with information on the potential for injury and illness resulting from MEC operations.

1.1 Regulations and Guidelines

Following all applicable requirements and regulations listed in the following publications will ensure the safety and health of on-site personnel and the local community:

- Occupational Safety and Health Administration (OSHA) General Industry Standards, 29 Code of Federal Regulations (CFR) 1910
- OSHA Construction Standards, 29 CFR 1926 (United States Army Corps of Engineers [USACE] Engineer Manual [EM] 385-1-1)

- EEG Health and Safety Program
- Army Regulation (AR) 385-40 (with USACE Supplement 1), Accident Reporting and Records
- United States Environmental Protection Agency (EPA) Hazardous Waste Management, 40 CFR 260-276, latest edition
- Engineer Regulation (ER) 385-1-92, Safety and Occupational Health Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities, 01 July 2003
- ER 385-1-95, Safety and Health Requirements for Ordnance and Explosives (OE) Operations, 16 June 2003
- Engineer Pamphlet (EP) 385-1-95a, Basic Safety Concepts and Considerations for Munitions and Explosives of Concern (MEC) Response Action Operations, 27 August 2004

1.2 References

In addition to the publications and regulations previously listed, the following manuals were used as reference material in the preparation of this document.

- Occupational Safety and Health Guidance for Hazardous Waste Site Activities, United States Department of Health and Human Services (DHHS), National Institute of Occupational Safety and Health (NIOSH), October 1985
- Threshold Limit Values (TLV) and Biological Exposure Indices for 1993-94, American Conference of Governmental Industrial Hygienists (ACGIH), 1993

2.0 Safety and Health Organization

2.1 General

2.1.01 All operations and personnel having potential exposure to site hazards are subject to the requirements of this SSHSP. Work may not be performed in a manner that conflicts with the intent of or the inherent safety, health, or environmental precautions expressed in this SSHSP. After due warnings, personnel violating safety procedures will be dismissed from the site.

2.1.02 The safety and health requirements listed in this SSHSP may change as site work progresses; however, no changes will be made without the approval of CEHNC and EEG. The organizational chart for EEG and this project is provided in the Accident Protection Plan.

2.2 Certified Industrial Hygienist

The certified industrial hygienist (CIH), Terry Douglas, is responsible for review and approval of this SSHSP. He is also responsible for providing consultation to the unexploded ordnance (UXO) quality control / safety officer (UXOQC/SO) on safety and health matters and for evaluating and authorizing any changes to the SSHSP.

2.3 UXO Quality Control / Safety Officer

2.3.01 The UXOQC/SO is to be determined. The UXOQC/SO will be a United States citizen and graduate of one of the following schools or courses:

- United States Army Bomb Disposal School, Aberdeen Proving Ground, MD
- United States Naval EOD (Explosive Ordnance Disposal) School
- EOD Assistants Course, Redstone Arsenal, AL; EOD Assistants Course, Eglin Air Force Base, FL; or a Department of Defense (DoD)-certified equivalent course

2.3.02 This individual shall have experience in MEC operations and supervising personnel, and shall have at least 10 years of UXO experience. In addition, this individual shall have the specific training, knowledge, and experience necessary to implement the Accident Prevention Plan and verify compliance with applicable safety and health requirements. This individual must be able to perform all functions enumerated for UXO sweep personnel and UXO Technicians I, II, and III. In addition, the UXOQC/SO must have the ability to implement the approved MEC and explosives safety program in compliance with all DoD, federal, state, and local statutes and codes; analyze MEC and explosives operational risks, hazards, and safety requirements; establish and ensure compliance with all site-specific safety requirements for MEC operations; enforce

personnel limits and safety exclusion zones for MEC removal operations, UXO and explosives transportation, storage, and destruction; and conduct safety inspections to ensure compliance with MEC safety codes.

2.4 Responsibilities of All Site Personnel

All EEG and CEHNC personnel who will be involved in on-site activities are responsible for the following:

- Taking all reasonable precautions to prevent injury to site personnel and being alert to potentially harmful situations
- Performing only those tasks that can be done safely and with the proper training provided
- Notifying the UXOQC/SO of any special medical conditions (e.g., allergies, contact lenses, diabetes, etc.)
- Notifying the UXOQC/SO of any prescription and non-prescription medication that a worker may be taking that might cause drowsiness, anxiety, or other unfavorable side effects
- Preventing spillage and splash of materials to the greatest extent possible
- Practicing good housekeeping by keeping the work area neat, clean, and orderly
- Immediately reporting all injuries, no matter how minor, to the EEG UXOQC/SO
- Complying with the SSHSP and all safety and health recommendations and precautions, and properly using the personal protective equipment (PPE) as determined by this SSHSP and/or the EEG UXOQC/SO
- Maintaining current training and medical documentation at the work site

3.0 Site History and Description

3.0.01 Spain ceded all of Puerto Rico to the United States in 1898 following the Spanish American War. The public lands in the Culebra Island archipelago were placed under the control of the United States Navy in 1901. A small permanent base of operations was constructed on Culebra Island around 1902. The base of operations (Lower Camp) was established in the former town of Idelfonso.

3.0.02 The Culebra Island archipelago was used for training purposes by the Navy and the United States Marines, and was later used by North Atlantic Treaty Organization (NATO) gun ships and carriers. Facilities set up by the Navy included a desalination plant, an airfield, barracks, helicopter pads, range instrumentation facilities, gun sites (for the defense of the islands), observation points, and impact ranges for aerial bombs and rockets, missiles, mortars, and naval projectiles.

4.0 Hazard Analysis

4.1 Task Descriptions

4.1.01 The work to be performed under this contract includes MEC surface clearance at the Cerro Balcon area on the Island of Culebra and on Isla Culebrita and additional cays surrounding Culebra. The tasks include:

- Surface clearance of MEC from approximately 30 acres at Cerro Balcon
- Surface clearance of MEC from approximately 82 acres on Isla Culebrita
- Surface clearance of MEC from approximately 39.5 acres on additional cays

4.1.02 Several activities are associated with the work tasks listed above, including:

- Location survey and mapping
- MEC clearance and electromagnetic survey
- Heavy equipment operation, including Bobcat with Bush Hog attachment
- Vegetation clearing using chain saw or bladed trimmer
- Intrusive investigation of partially buried MEC
- Disposal of MEC
- Boat transportation
- Scrap removal

4.1.03 The hazards for these activities are described below.

4.2 Hazard Identification

4.2.1 Preliminary Evaluation

Qualified personnel have performed a preliminary evaluation of the tasks and sites. During development of this SSHSP, a Certification of Activity Hazard Analysis has been completed for each task or group of similar tasks to be conducted under this SSHSP (the hazard analysis forms are included in the Accident Prevention Plan). This assessment has been conducted to comply with the revised OSHA PPE Standard 29 CFR 1910.132 and to ensure that all tasks have been assessed to determine the PPE and controls needed to protect site personnel; however, evaluation of work site characteristics and hazards is an ongoing process that will continue throughout the project. If changes occur in the level or types of hazards present for a currently evaluated task, or if a new task is added to the SOW, the UXOQC/SO will inform the EEG CIH of the change. If

needed, a new Certification of Activity Hazard Analysis form will be completed outlining the new hazards, control methods, and PPE for the task.

4.2.2 Chemical Exposure Risk Assessment

In assessing the risk of chemical exposure, EEG personnel examined archival data and sampling results provided by EEG and CEHNC, current land usages, the physical properties of potential site contaminants, the potential exposure routes, and the operational tasks to be performed. Examination of these items indicates that the potential for exposure to chemical hazards will essentially be non-existent during all planned site activities to which this SSHSP applies. If site activities are modified, the potential for chemical exposure will have to be re-evaluated.

4.2.3 Physical Hazards Identification

4.2.3.01 Physical hazards expected to be encountered in conducting operations are heat stress, flammable materials, lifting, operation of hand and power tools, inclement weather, uneven/unstable surfaces, sharp objects (e.g., nails and broken glass), trips and falls, excessive noise, dense vegetation, biological hazards, and heavy equipment.

4.2.3.02 Site personnel should look for potential safety hazards and immediately report the hazards to the EEG UXOQC/SO or the senior UXO supervisor (SUXOS). Site personnel will be informed of the actions to be taken to control or remove the hazard.

4.2.3.03 The EEG UXOQC/SO shall be responsible for thoroughly evaluating each day's field operations with respect to potential physical hazards. Any suspect or known physical hazards and the specific procedures to control them shall be reviewed and documented during the daily tailgate safety briefing.

4.2.4 MEC Hazards

The hazards associated with MEC include the possibility of personnel injury or death caused by explosion, fire, fragmentation, or over-pressurization. These hazards may result if MEC is not properly located, identified, handled, transported, or disposed of. The risk of personnel exposure to MEC during this project is high, primarily due to the nature and amount of ordnance used on this site. While there is no "safe" procedure for dealing with MEC, using procedures that are considered the least dangerous reduce the exposure. Maximum safety in any MEC operation can be achieved through adherence to applicable safety precautions, a planned investigation, and removal approach coupled to strong intense supervision. For all site operations with the potential

for exposure to MEC, only those personnel absolutely essential to the operation shall be allowed in the exclusion zone (restricted area). The safety requirements that are discussed in this work plan have been developed to reduce exposure and will be used throughout this tasking.

4.2.5 Biological Hazards

Biological hazards include stinging insects such as bees, wasps, and hornets; poisonous plants; ticks; mosquitoes; and acacia thorns. Employee awareness and safe work practices will reduce the risk associated with these hazards.

4.3 Hazard Communication

To comply with the OSHA Hazard Communication Standard 29 CFR 1910.1200 and to ensure that site personnel are informed of the hazards associated with the materials with which they work, the following shall apply to all commercial products containing hazardous substances that are brought on site.

- A written hazard communication program will be made available to site personnel.
- A Material Safety Data Sheet (MSDS) will be maintained for each product containing a hazardous substance that is used on site.
- All containers not supplied with adequate hazard labeling shall have a hazard communication label affixed to the container that communicates the health and physical hazards associated with working with the material.
- Employees working with hazardous substances shall be trained in accordance with the requirements of 29 CFR 1910.1200.
- An inventory (MSDS) of all hazardous substances used on site will be maintained in Attachment B of the Accident Prevention Plan.
- Personnel, including subcontractors, affected by hazardous substance use shall be informed of the hazards.
- When available, MSDSs for chemicals known or suspected to be on site will be maintained in the field office. Workers will be advised of the location and contents of these MSDSs in accordance with the requirements of this SSHSP.

5.0 Training Plan

5.1 General

All personnel assigned to or regularly entering the site will have the required training prior to participating in site activities, and documentation of all training is required to be kept on site. In accordance with 29 CFR 1910.120 and other OSHA regulations, applicable training shall include the following.

5.1.1 Basic OSHA Training

All general site workers must have the 40-hour hazardous waste operations and emergency response (HAZWOPER) training course and three days of field experience under the direct supervision of a trained and experienced supervisor. On-site management must have 8 hours of specialized supervisory training. All workers must have an annual refresher (8 hours) if initial training is more than one year old. All training will be documented.

5.1.2 First-Aid and CPR Training

At least two employees per site will be certified in first-aid and cardiopulmonary resuscitation (CPR). The training shall be equivalent to that provided by the American Red Cross.

5.1.3 Site-Specific Safety Indoctrination

This training covers the information and mandates of the project SSHSP. This training stresses preventive measures but also addresses emergency response procedures and will cover the chemical and physical hazards of the site and site operations.

5.1.4 Blood-Transmitted Pathogen Training

The UXOQC/SO will primarily be responsible for rendering first aid in the event of an injury or accident, but other EEG site personnel may be needed to assist in rendering first aid for severe injuries; therefore, on-site EEG personnel will receive training in controlling exposures to blood-transmitted pathogens. This training will consist of the following:

- Labeling and color-coding of infectious waste
- Management and employee responsibilities
- Review of the blood-transmitted pathogen standard
- Description of the risks of exposure and how blood-transmitted pathogens are transmitted
- Hepatitis B Vaccine Declination form (see Appendix F of the Work Plan)

- Requirements of the exposure control plan
- Post-exposure procedures
- Methods of protection against exposure and procedures for decontamination
- First-aid or medical assistant qualified employee and EEG's bloodborne pathogen program (29 CFR 1910.1030, and EM 385-1-1, Section 03.A.06)

5.1.5 Hearing Conservation Training

All site personnel exposed to noise levels exceeding an 8-hour time-weighted average (TWA) of 85 decibels (A-weighted) [85 dB(A)] will be provided with training that addresses the following topics:

- Noise exposure limits
- Physical and psychological effects of high noise exposure
- Elements of the hearing conservation program
- Selection, use, and limitations of hearing protection devices

5.1.6 Fire Extinguisher Training

All EEG site personnel will be trained in the general principles of fire extinguisher selection and use and the hazards associated with incipient-stage firefighting. This training will, when feasible, include hands-on practice with a live test fire.

5.1.7 Tailgate Safety Briefings

5.1.7.01 Each day, before starting work on site, all personnel, including contractor, subcontractor, and government employees, will be given a safety briefing by the EEG UXOQC/SO that identifies potential hazards and risks that may be encountered during that day's activities. Additional training for the use of safety equipment, emergency medical procedures, emergency assistance notification procedures, and accident prevention, as well as discussion of the Work Plan, will ensure that work accomplishments can be carried out in a safe and effective manner. At the conclusion of each day's work, a debriefing for all employees will be held if needed.

5.1.7.02 Records of all tailgate safety briefings documenting date, attendance, and topics covered will be maintained in the EEG Tailgate Safety Briefing/Training Form as part of the project documents.

5.2 Visitor Training

Site visitors are defined as persons who are not employed at the project site and do not routinely enter restricted work areas, and whose presence is of short duration (i.e., one to two days at a time or per month). Visitors may include client personnel, EEG personnel, subcontractor personnel, commercial vendors, political representatives, and auditors or inspectors from local, district, or federal agencies.

5.2.1 General Visitor Requirements

The following requirements apply to visitors whose purpose is to observe site conditions or field activities.

- The senior EEG on-site representative and the EEG UXOQC/SO will be notified of the nature and duration of the visit before visitors are permitted to enter the work site.
- The Visitor Log will be completed, including the individual's name, the date, and the name of the company or agency represented.
- The site visitor will be escorted by an EEG representative, preferably the site supervisor or UXO Technician III, at all times while in the area.
- Visitors will comply with specific safety and health requirements, as applicable.

5.2.2 Visitor Training Requirements

All visitors will receive site-specific training to ensure that potential hazards and risks are identified. This training will consist of a safety briefing by the EEG UXOQC/SO that will include the following:

- Required PPE
- Location and description of potential hazards and risks
- Areas of the site that are closed to visitors
- The site evacuation plan and emergency procedures
- Other topics as deemed appropriate

5.3 Supplemental Training

Supplemental training (e.g., confined space, hazard communications, and OSHA chemical-specific requirements), as determined by the EEG UXOQC/SO, may be required for site-specific contaminants and/or changes in site conditions.

5.4 Weekly Training

At the start of each work week (normally Monday), a site-specific safety topic will be selected and discussed in detail. All site personnel are required to attend the training, and the EEG UXOQC/SO will document this training on the EEG Tailgate Safety Briefing / Training Form. The training will consist of site-specific hazards (e.g., known chemicals, ordnance, and heat stress), and it will be given in conjunction with the tailgate safety briefing.

5.5 Buddy System Training

Workers shall be instructed that all site work will be performed using the buddy system. Team members will keep in visual contact with each other at all times. Team members will be made aware of any slip or trip and all lifting hazards, as well as any potential exposure to chemical substances, cold stress, and general hazards within their work area.

6.0 Personal Protective Equipment Program

6.1 Introduction

6.1.01 All personnel performing operations on site shall be required to use the appropriate level of protection as specified in the Certification of Activity Hazard Analysis forms. This SSHSP makes provisions for the use of Level D and Modified Level D PPE in accordance with the hazards associated with a given task or operation. All PPE requirements for site operations, activities, or zones are based on available site characterization and historical data. The PPE levels will need to be reassessed if any of the following occur:

- Appearance of previously unidentified chemicals or conditions
- Introduction of a new task or expansion of a previously evaluated task
- Ambient weather condition changes that impact the use of assigned PPE
- Discovery and confirmation of chemical warfare materiel (CWM)

6.1.02 For work tasks that are assigned after the approval of this SSHSP, the EEG UXOQC/SO will assess the hazard, assign the appropriate PPE level, complete a Certification of Activity Hazard Analysis form, and forward the form to the EEG CIH. Upon approval by the CIH and CEHNC, the new form will be incorporated into the SSHSP. The EEG CIH will allow any changes in PPE levels involving downgrading of PPE levels only after review.

6.2 Special Considerations

The following special considerations shall be observed in the selection and use of Level D and Modified Level D PPE.

- Hard hats are required only when working around heavy equipment or when a head impact hazard exists.
- Steel toe/shank boots are not required during surface or subsurface location of MEC unless a serious toe hazard exists, whereupon a fiber safety toe will be used.
- Safety glasses will be required only when an eye hazard exists and will be selected to provide site personnel with the best protection from physical hazards, such as flying objects and ultraviolet radiation protection.
- The revised OSHA standards for PPE (29 CFR 1910.132-138) will be incorporated into all phases of PPE selection, training, and use.
- Eye protection will be required during brush clearing.

6.2.1 Level D PPE

The following PPE will be worn during general site zone activities:

- Work clothes or coveralls (cotton)
- Hard hat (as required)
- Boots: fiber-toed or leather work boots (as required)
- Work gloves
- Safety glasses (as required)
- Two-way radio, one per team

6.2.2 Modified Level D PPE

The following PPE will be worn when using power equipment for brush clearing (same as Level D, but with the following additions):

- Leather work gloves
- Hard hat with face shield (wire mesh preferred)
- Kevlar chaps
- Ear plugs or muffs, as appropriate
- Fiber toe guards or fiber-toed boots

7.0 EEG Medical Surveillance Program

EEG provides its employees with an annual in-depth physical examination, including blood chemistry with complete blood count and differential, urinalysis, medical history, required chest X-rays, audiogram, pulmonary function testing, and a physician's interpretation of an employee's ability to wear a respirator.

7.1 EEG Comprehensive Occupational Health Program

7.1.01 EEG has established and will enforce a comprehensive Occupational Health Program (OHP) in compliance with 29 CFR 1910 to prevent, diagnose, and treat occupational illnesses and injuries sustained on site. All site personnel and subcontractors involved with site activities will be included in the OHP.

7.1.02 The purpose of the OHP is to (1) assess the individual's health prior to working in a hazardous or physically stressful environment, (2) determine the individual's suitability for work assignments requiring the use of PPE, and (3) monitor for evidence of changes in the individual's medical indicators that could be related to the work. The assessment addresses any physical conditions the employee could have that would predispose him or her to illness or injury due to chemical exposure or the physical demands of using PPE.

7.1.03 The examining physician will be provided with information related to the employee's duties, potential exposures to chemical and physical hazards, and a description of the levels of PPE to be used by the employee. The physician will conduct a physical examination as specified in this section and then review the examination results to determine whether the employee is medically qualified to perform the proposed hazardous work. The physician will determine the need for any subsequent (i.e., exit or supplemental) medical examinations.

7.1.04 A physician's statement certifying that the employee is physiologically fit to work in hazardous materials operations will be received and maintained on file at EEG prior to the commencement of work. The physician's statement will also include information related to limitations on the employee's work assignment, results of the examination and tests, and a statement that the employee has been informed of the results of the medical examination.

7.2 Certification

EEG employee participation in the medical surveillance program will be a part of the employee's permanent medical record maintained at EEG's Newberry, Florida, office. A list certified by the

project manager, including the date of the last examination and physician's name, will be maintained on site. If subcontractors are used, they will also submit documentation of medical surveillance program participation for all site employees.

7.3 Occupational Health Services

Complying with the requirements of 29 CFR 1910, EEG has designated the following physician to oversee the site-specific medical surveillance and occupational health services:

Lance Chodosh, MD
4340 Newberry Road
Gainesville, FL 32607
Telephone (352) 372-3360

7.3.1 Medical Surveillance Examinations

Job-related medical surveillance examinations are baseline, annual, supplemental, and termination examinations. The content of these examinations is hazard-specific and requires EEG to provide the examining physicians with a complete inventory of chemical, biological, and physical exposure hazards, including relevant medical surveillance documents and pertinent information related to the following:

- Hearing conservation
- Treatment of occupational illness and injury
- Vision conservation
- Medical evaluation of respirator wearers.

7.3.1.1 Baseline and Annual Examinations

The baseline and annual assessments will include the following:

- Complete medical and occupational history
- Drug testing
- Chest X-ray (preliminary assessment) and/or electrocardiogram (when determined to be necessary by the physician)
- Laboratory studies, including a complete blood count
- Physical examination
- Urinalysis
- Audiometry and visual screening
- Pulmonary function testing (FEV and FVC)

7.3.1.2 Supplemental Examination

Any worker receiving a potentially harmful level of exposure to hazardous chemical or biological material or who exhibits possible exposure symptoms will undergo a supplemental examination. Any worker who develops a lost-time illness or sustains a lost-time injury will be re-examined. The physician will certify in writing that the employee is fit to return to work. If necessary, activity restrictions will also be specified in writing. Additional tests will be conducted if contaminants or potential exposures dictate, and they will be determined by the examining physician.

7.3.1.3 Termination Examination

Upon termination of employment, personnel who have worked continuously at a hazardous waste project site for more than six months will be given the opportunity to undergo a termination examination equivalent to the baseline examination. The physician will determine specific examination tests.

7.3.2 Immunizations

Personnel working on this site will receive a tetanus immunization prior to beginning work.

7.4 Health Care Administrative Services

In support of the OHP, Dr. Chodosh will establish and maintain medical records. These records will be treated as private and confidential information, and they will be complete enough to provide data for use in health maintenance, treatment, and epidemiologic studies, and to help the government and EEG with program evaluation and improvement. The medical record will contain sufficient information to identify the patient, support the diagnosis, justify the treatment, and document an additional follow-up case or referral. The physician's written opinion for all medical examinations will be as specified in 29 CFR 1910.120, Subpart (f)(7).

7.5 Medical Support Policies

EEG site personnel will be provided routine occupational health services by Dr. Chodosh at no cost to the employee. The scope of occupational health services provided by EEG shall include efforts to prevent, diagnose, or treat occupational injuries or illness. EEG shall not provide definitive diagnoses or treatments for non-occupational injuries or illnesses. The only exception is an emergency where immediate medical attention is required to prevent the loss of life, preclude permanent injury that would result if treatment were delayed, or relieve suffering.

7.5.1 Operational Concepts

Two appropriately trained personnel will provide on-site first-aid and CPR support. If specialized or elevated care is necessary, the injured person will be transported to the appropriate medical facility by an on-call advanced life-saving service.

7.5.2 Treating Hospitals

The Culebra Community Health Center (telephone 787-742-3511) located at Calle William Font Final will provide primary treatment for illnesses or injuries that occur on site. This clinic has trauma capabilities; however, severe cases will be sent by helicopter to the hospital at San Juan. The Culebra Community Health Center will act as coordinator should a severe trauma occur.

7.5.3 On-Site Medical Supplies

Medical supplies for the treatment of minor injuries and burns will be maintained on site by EEG and will be inspected weekly by the EEG UXOQC/SO.

7.6 Environmental and Personal Monitoring Plan

Monitoring will be conducted during specified site activities to evaluate potential physical hazards. Hazard evaluations will assist in determining the effectiveness of control measures, the need for upgrading or downgrading PPE requirements, and the effectiveness of work zones (WZs) and safe work practices. Direct reading instruments will be used during site operations to detect and qualify the physical hazards. If a reading exceeds the action levels specified in **Table 7-1**, the EEG UXOQC/SO will take steps to correct the situation.

Table 7-1. Site Monitoring Schedule / Action Levels

Contaminant or Hazard	Monitoring Equipment	Monitoring Responsibility	Monitoring Frequency / Location	Action Level	Action to be Taken
Heat stress	Direct reading wet bulb globe temperature (WBGT) monitor	UXOQC/SO	Continuously, whenever ambient temperatures exceed 70°F	See Table 9-4 to determine WBGT temperatures where modification of work/rest regimens will begin	See Table 9-4 for modifications to work/rest regimens
Noise	Sound level meter	UXOQC/SO	Initially when tools or equipment are operated and periodically thereafter, according to the recommendations of the CIH	Sound levels greater than 85 dB(A)	Conduct noise dosimetry reading to determine the 8-hour TWA and advise CIH

Contaminant or Hazard	Monitoring Equipment	Monitoring Responsibility	Monitoring Frequency / Location	Action Level	Action to be Taken
Noise	Noise dosimeter	UXOQC/SO	Whenever noise levels in the hearing zone exceed 85 dB(A)	Greater than 85 dB(A) for an 8-hour TWA	Report dosimeter readings to CIH to ensure that hearing protection is adequate for the level of noise experienced

7.6.1 Monitoring Responsibilities

The EEG UXOQC/SO and other site personnel trained in the proper calibration and operation of monitoring equipment will conduct monitoring on an as-needed basis. Monitoring equipment to be used during operations will include the following, as needed.

- Sound level meter is used as a screening device to measure the sound power being emitted by a source. This instrument helps identify operations where hearing protection and noise dosimetry monitoring may be needed.
- Noise dosimeter is used to calculate the 8-hour TWA noise exposure.
- Wet bulb globe temperature (WBGT) monitor is used to establish work/rest regimens for site personnel working in temperatures over 70 degrees Fahrenheit (°F).

7.6.2 Monitoring Schedules

Exposure monitoring will focus on the potential exposure to noise generated during mobilization and demobilization and brush-clearing activities. Real-time monitoring, using direct reading instruments, will be conducted at a frequency respective to operations with high noise levels. **Table 7-1** identifies the type of monitoring equipment to be used, the frequency at which the monitoring will be conducted, assignment of monitoring responsibility, monitoring method to be employed, action level, and the resultant action to be taken.

7.6.3 Calibration and Maintenance

All monitoring instrumentation used on site will be calibrated and/or response-checked in accordance with the manufacturer's specifications, before and after use each day. If an instrument fails to calibrate or respond correctly, it will be removed from service until it can be repaired in accordance with the manufacturer's specifications. Instruments used in the WZ will be cleaned with wet wipes after each day of use to remove any gross amounts of dust or debris.

8.0 Site Control and Layout

8.1 Site Zones

EEG may establish work areas as required for the field effort. The boundaries of each work area, regardless of its configuration, will be clearly identified to prevent accidental intrusion by personnel not immediately involved with site operations. Each work site will have a support zone (SZ) that will be used as a staging area for personnel and equipment supporting operations in the WZ. The SZ will include the site access control point, an area for visitors, and a break area for site workers. The EEG UXOQC/SO will delineate and increase or decrease these zones based on site conditions and activities. The zones will be marked on the site map, and the map will be posted at the entrance to each site. The establishment of access points and an entry corridor will be determined by EEG personnel based on the MEC clearance of certain areas.

8.1.1 Support Zone

The SZ will be used as the staging area for site operations and for other support functions required to maintain smooth operations on site. The SZ includes the change area, lunch and break areas, and supply storage areas. The SZ is the designated area for tobacco product use and eating and drinking.

8.1.2 Work Zone

The WZ will be the area where actual site activities related to the investigation of MEC contamination will be conducted. It is anticipated that multiple WZs will be established during the conduct of this project. Each WZ will be clearly marked with flagging, and the EEG UXOQC/SO will control entry into these areas. Non-UXO-qualified personnel entering the WZ will be limited to cleared areas or escorted by UXO-qualified personnel at all times. The maximum fragmentation distance will determine the WZ boundary.

8.2 Site Maps

Prior to the initiation of site activities, the UXOQC/SO will generate a site map for each WZ that indicates the following information: site size and shape; direction of the prevailing wind; entry and exit points; restricted areas; designated assembly points; location of fire extinguishers and other safety equipment; and location of ponds, streams, pits, tanks, and other site hazards. The UXOQC/SO will use the site map during the tailgate safety briefings to inform site personnel of

the locations of the previously listed items. To minimize clutter on the map, overlays can be used to portray the necessary information.

8.3 Center of Operations

The center of operations for the site will be located on Culebra at a location to be determined. Site personnel records and complete site maps will be kept at this location. The maps will detail the location of entry points, WZs, SZs, staging areas, and survey areas.

8.4 MEC Areas

8.4.01 There will be only shallow excavation as this project is scoped for surface clearance only.

8.4.02 EEG shall dispose of any encountered MEC in accordance with the Work Plan. Disposal or venting operations will be conducted at sites or ranges established in the field after receiving CEHNC approval. Once designated, EEG personnel will secure the disposal and venting sites whenever disposal activities are being conducted.

8.5 Site Security

Site security will be maintained during working hours by the UXOQC/SO, who will ensure that the only personnel entering a given WZ are those who are wearing the proper PPE and have been trained and medically cleared to enter the area. The UXOQC/SO will also ensure that all other safety and health precautions are in place prior to entry by site personnel.

8.6 Buddy System

8.6.01 The buddy system is an important element in controlling personnel exposure to site hazards. No site personnel is allowed to work without another qualified worker there to provide assistance if needed. At all times, each buddy should be able to:

- Observe their buddy for signs of chemical or extreme temperature exposure
- Periodically check the integrity of their buddy's protective clothing
- Observe the site area in which they are working for hazards
- Remain within verbal or visual contact with their buddy
- Notify the personnel in the SZ if emergency assistance is needed

8.6.02 Enforcement of the buddy system by the UXOQC/SO will begin at the access control point to the WZ.

8.7 Site Communications

8.7.01 Effective on- and off-site communication is an integral part of site control and will be established prior to initiating site activities. Off-site communication is required to ensure effective communication with management and emergency response personnel. On-site communication will be used to coordinate site operations, maintain site control, pass along safety information such as monitoring results and work/rest periods, and alert site personnel to emergency situations. All site personnel will be familiar with the different methods of on- and off-site communication. The methods of site communication that may be used on this project are:

- Communication off site:
  —Two-way radio
  —Cellular telephone
- Communication on site:
  —Two-way radio
  —Air horn
  —Hand signals

8.7.02 Site personnel will be familiar with the following hand and audible signals.

- Hand gripping throat — "Breathing problem, can't breathe."
- Thumbs up — "OK, I'm all right, I understand."
- Thumbs down — "No, negative."
- Pointing to ear(s) — "Can't hear, don't understand."
- Waving hand(s) over head — "Need assistance now."
- Pointing to eyes then pointing to a person/object — "Watch person/object closely."
- Grab buddy's wrist — "Evacuate site now, no questions."
- One long horn or siren blast — "Evacuate site to assembly point."
- Two short horn/siren blasts — "Condition under control, return to site."

8.8 Hygiene and Sanitation

8.8.1 Personal Hygiene

8.8.1.01 Hygiene facilities will be established on site to ensure that personnel maintain good personal hygiene. These facilities shall include personnel washing areas and toilet facilities for all site personnel. The personnel hygiene facilities will conform to the requirements specified in 29 CFR 1910.120.

8.8.1.02 Personnel are required to wash their hands, face, and other exposed skin areas prior to leaving the site for breaks or lunch. In addition, personnel will be instructed to personally monitor their hand-to-eye and hand-to-mouth contact at all times due to the hazardous nature of the manzanillo plant and other poisonous plant species. Disposable towels, washcloths, liquid soap, or disposable wipes will be provided for personnel.

8.8.2 Routine Equipment Decontamination

Tools and equipment used in the WZ will be kept free of soil and other debris and will be cleaned at the end of each day to ensure that the equipment is maintained in a safe operating condition.

8.8.3 PPE and Decontamination Procedures

Site personnel using PPE (e.g., gloves, safety glasses) will keep the equipment clean and in good working condition.

8.8.4 Sanitation

Site sanitation will be established and maintained in accordance with 29 CFR 1910.120(n).

8.8.5 Potable Water Supply

An adequate supply of potable (drinkable) water shall be provided on site at all times, and it will be supplied in accordance with the following provisions.

- Containers used for potable water shall be capable of being tightly closed, equipped with a tap, and maintained in a sanitary condition.
- A container used for the distribution of drinking water shall be clearly labeled identifying its contents and not used for any other purpose.
- Water shall not be dipped from the container, and the use of a common cup will not be allowed.
- Where single-service cups are provided, separate sanitary containers will be provided for the storage of the unused cups and the disposal of the used cups.

8.8.6 Non-Potable Water

Outlets and storage containers for non-potable water, such as water for firefighting or decontamination, will be clearly labeled to indicate that the water is not suitable for drinking, washing, or cooking. At no time shall there be a cross-connection or open potential between a system furnishing potable water and a system furnishing non-potable water.

8.8.7 Toilet Facilities

Temporary toilet facilities will be located at the site. Chemical, re-circulating, combustion, or flush toilets may be used to fulfill this requirement. Each temporary toilet will be naturally lighted, have ventilation, be lockable from the inside, and be serviced weekly. To ensure sanitary and adequate facilities, EEG will provide toilet facilities in accordance with the recommendations of the supplier, who usually stipulates one toilet for each 10 to 15 site personnel.

8.8.8 Washing Facilities

Hand- and face-washing facilities will be set up in the SZ and used by all personnel exiting the WZ prior to eating, drinking, tobacco use, or other hand-to-face activities. When feasible, washing facilities will consist of hot and cold running water, soap, and drying towels. If this is not feasible, disposable wipes or an equivalent will be provided.

8.8.9 Site Housekeeping

All work areas will be maintained in a clean and neat condition, free of loose debris and scrap. Any materials and equipment not being used will be removed and stored or disposed of accordingly. All work areas will be supplied with a trash receptacle with lid, the contents of which will be emptied daily.

9.0 Emergency Response Plan and Equipment

9.1 Pre-Emergency Planning

9.1.01 The Culebra Community Health Center (telephone 787-742-3511) located at Calle William Font Final on Culebra Island has the capability of being considered a trauma center when a particular doctor is on Culebra Island. The island has an ambulance that responds; the doctor evaluates the situation and requests assistance as needed. At this time the doctor will request air support from Fajardo or may use the local airport for support. In the case of a serious medical emergency, injured personnel will need to be initially transported to the town of Fajardo, Puerto Rico. This emergency response system is normal to Culebra Island and has not been established for CEHNC projects.

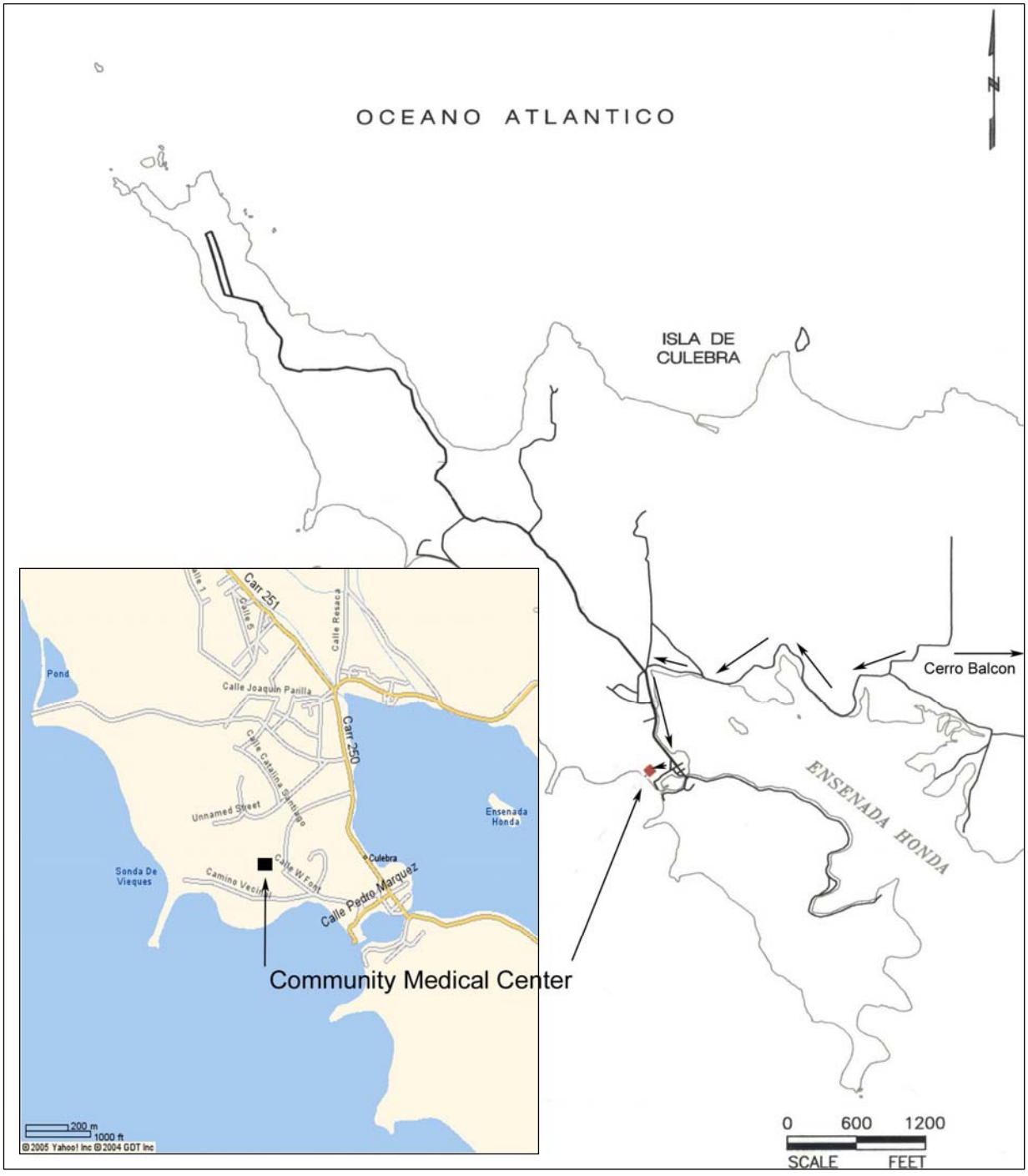
9.1.02 Evacuation, assembly, and site control procedures, the hospital route map (**Figure 9-1**), and emergency numbers will be posted in the office/break area. Hospital route maps shall also be maintained in the designated emergency vehicle, as well as all other site vehicles, and all personnel will be aware of the location of the closest telephone and/or radio communications. To ensure its adequacy, the emergency plan shall be tested prior to commencing site operations. This test shall include a person with a simulated injury who is transported to the supporting medical facility.

9.1.03 The emergency equipment (**Table 9-1**) will be maintained in proper working order and checked daily for completeness during the site work. In addition, a cellular telephone will be located in a support vehicle and verified to be in working order prior to the start of work.

Table 9-1. Emergency Equipment

Item	Number	Location	Operations
Portable Eye Wash Kit	1 (each location)	Support Vehicles / SZ	All
CPR Pocket Mask	1	Support Vehicles / SZ	All
15-min Gravity-Feed Eye Wash	1	Support Vehicles / SZ	All
Air Horn	1	Support Vehicles / SZ	All
First-Aid / Burn Kit	2 (1 each location)	SZ / WZ	All
Fire Extinguisher	1 (each location)	Support Vehicles / WZ	All

Figure 9-1. Hospital Route Map



9.2 First-Aid Kits

The size and number of kits, which include first-aid and eye-wash supplies, a CPR mask, and a burn blanket, will be sufficient to accommodate the maximum number of people (including government personnel and visitors) on site at any given time. The kits will be located at each work site, and the location will be made known to all personnel. Kit locations will be provided with adequate water and other supplies necessary to clean burns, wounds, or lesions.

9.3 Personnel Roles and Lines of Authority

Emergency situations can be minimized through proper implementation of the SSHSP. If an emergency situation develops, the EEG UXOQC/SO will act as the on-scene incident commander. The initial response will be to handle the situation in a calm, deliberate manner so that the situation is controlled and the safety and health of the site workers and surrounding community are not jeopardized. One person designated by the UXOQC/SO will be the off-site coordinator. This person will make all telephone calls to the appropriate emergency response agency. In most cases, this person will be the site manager. The site manager will be responsible for reporting the accident to the on-site contracting officer representative and the EEG project manager.

9.4 Emergency Contacts and Reporting

The list of the emergency phone numbers in **Table 9-2** should be readily available to all employees on the job site. All telephone numbers can be reached via cellular telephone.

Table 9-2. Emergency Telephone Numbers

Agency	Contact	Telephone Number
Police		(787) 742-3501
Fire		(787) 742-3530
Ambulance		(787) 742-3511
Poison Control Center		(809) 962-1253
Culebra clinic		(787) 742-3511
CEHNC project manager	Brendan Slater	(256) 895-1507
USACE Jacksonville	Robert Bridgers	(904) 232-3085
EEG SUXOS	Mike Zaloudek	Obtained upon mobilization
EEG project manager	Mark Bagel	(352) 332-3888
EEG Team 1	Team 1 leader	Obtained upon mobilization
EEG Team 2	Team 2 leader	Obtained upon mobilization

Agency	Contact	Telephone Number
Safety / QC	UXOQC/SO	Obtained upon mobilization
EEG Culebra office		Obtained upon mobilization
EEG Culebra fax		Obtained upon mobilization
EEG site manager	Gary Tourtellotte	Obtained upon mobilization
Federal Aviation Administration (FAA)	Diana Rivera	(809) 253-8694
Coast Guard	Lt. Langum	(809) 729-6800 x227 or x228

9.5 Emergency Procedures

9.5.01 An air horn will be carried by the work team, and one will be kept at the office. One long blast on the air horn will be the signal to immediately evacuate the site. Personnel in the WZ will evacuate to the assembly point specified during the tailgate safety briefing. If the assembly point used by WZ personnel is different from that used by SZ personnel, the EEG UXOQC/SO will use radio communications to coordinate accounting of all site personnel. Once all personnel are accounted for, the EEG UXOQC/SO will outline the actions to be taken as determined by the situation. Two short blasts is the "all clear" signal.

9.5.02 No one will attempt emergency response or rescue until the situation has been assessed and the appropriate response outlined by the EEG UXOQC/SO. Rescue or response may include the following actions, with some actions conducted concurrently.

1. Enforce the buddy system

   Allow no one to enter a contaminated area or hazardous area without a partner. At all times, personnel in the WZ should be in line of sight or within communications contact with the SUXOS or a designated appointee.
2. Survey casualties

   Locate all victims and assess their condition. Determine resources needed for stabilization and transport.
3. Assess hazards

   Assess existing and potential hazards to site personnel and the off-site population. Determine whether or how to respond, the need for evacuation of site personnel and off-site population, and the resources needed for evacuation and response.
4. Request aid

   Contact the required on- or off-site personnel or facilities, such as the ambulance, fire department, police, etc. (see **Table 9-2**).

5. Allocate resources

   Allocate on-site personnel and equipment to rescue and initiate incident response operations.

6. Control

   Assist in bringing the hazardous situation under complete or temporary control and use measures to prevent the spread of the emergency (e.g., cover hole with tarp or plastic or wood, control fire, and secure site).

7. Extricate

   Remove from or help victims leave the area.

8. Stabilize

   Administer any medical procedures that are necessary before the victims can be moved. Stabilize or permanently fix the hazardous condition. Attend to what caused the emergency and anything damaged or endangered by the emergency (e.g., drums and tanks).

9. Transport

   No one will be transported without being decontaminated. Take measures to minimize chemical contamination of the transport vehicle, ambulance, and hospital personnel.

10. Log casualties

    Record who, time, destination, and condition at transport.

11. Track casualties

    Record disposition, condition, and location.

9.5.03 Communication with response services will be conducted by the EEG UXOQC/SO followed by notification to, as events allow, the CEHNC Safety and Occupational Health Office and the CEHNC CIH responsible for the investigation.

9.5.1 Accident / Incident Reporting

In the event of an accident or incident, the EEG UXOQC/SO will be immediately notified. Within 24 hours of any reportable accident (i.e., personal injury, damage to equipment, or physical damage in excess of $2,000), the EEG UXOQC/SO will notify the CEHNC project manager and will complete and submit an accident report on ENG Form 3394, in accordance with AR 385-40 and the USACE supplements to that regulation. A copy of ENG Form 3394 with instructions is included in Appendix F of the Work Plan.

9.5.2 Fires and Explosions

9.5.2.1 Fire Extinguishers

A dry-chemical-type 4A:20B:C fire extinguisher will be available at each individual work site. Dry chemical fire extinguishers will be provided at all other site locations where flammable materials may present a fire risk. A fire extinguisher rated at least 1A:10B:C will be located with each piece of heavy equipment and in each site vehicle.

9.5.2.2 Small Fires

A small fire is defined as a fire that can be extinguished with a type 4A:20B:C fire extinguisher. In the event of a small fire, site personnel will take the following actions.

- Evacuate all unnecessary personnel from the area, preferably to an upwind location.
- Attempt to extinguish the fire using portable fire extinguishers or by smothering it from an upwind location. (**Note:** Do not attempt to extinguish a fire involving explosives or explosive liquids.)
- Request emergency response assistance (i.e., ambulance, fire, and police), as needed, for any injuries or exposures to hazardous chemicals.

9.5.2.3 Large Fires

In the event of a large fire, or small fire that cannot be extinguished, the following actions will be taken.

- Evacuate all unnecessary personnel from the site, preferably to an upwind location.
- Notify the fire department or other emergency response services (i.e., police, fire, ambulance, and hospital), as needed.
- Order the appropriate level of protective clothing to be worn by personnel fighting the fire. Try to fight the fire from an upwind location.
- Do not attempt to extinguish a fire involving explosives.

9.5.2.4 Explosions

In the event of an explosion, all non-essential personnel will evacuate the site, required support equipment and personnel will be requested, and the CEHNC contracting officer or designated representative and the EEG project manager will be notified.

9.5.3 First-Aid Procedures

The following first-aid procedures will be followed when on-site first-aid personnel must render assistance for individuals injured on site.

- For minor injuries, use routine first-aid procedures.
- For major injuries, immediately call an ambulance and administer the appropriate first aid while awaiting arrival of the ambulance.
- Use Red Cross-approved measures for treatment.
- Wash or rinse affected area thoroughly with copious amounts of soap and water, and then provide appropriate medical attention if required.
- If chemicals have been splashed into the eyes, rinse eyes for at least 15 minutes.
- If illness or injury involves the inhalation of hazardous materials, move victim to fresh air and, if necessary, decontaminate and transport to the hospital.
- For any injury or illness involving exposure to hazardous chemicals, decontaminate the victim and transport to the hospital for professional medical attention.
- The EEG UXOQC/SO will provide personnel data sheets to the appropriate medical personnel as requested.

9.5.4 Inclement Weather

9.5.4.01 In the event of inclement weather, electrical storms, or tropical storms, it may be necessary to cease operations and evacuate the site. The EEG UXOQC/SO and the site manager will be responsible for monitoring the weather on a daily basis and advising the SUXOS and the personnel of the forecast. In the event of adverse weather, the EEG UXOQC/SO will determine whether work can continue without sacrificing the safety and health of site personnel. Items to be considered in determining whether work should continue include:

- Heavy rainfall
- Approaching tropical storms
- Limited visibility
- Malfunctioning of monitoring equipment
- Potential for heat stress
- Tornadoes
- Potential for accidents

9.5.4.02 Severe weather with thunderstorms and associated lightning and tornadoes is a common feature of the region; therefore, meteorological conditions will closely be watched. Thunderstorms and tornadoes often occur late in the afternoon on hot days, but they can occur at any time of the day in any season of the year.

9.5.4.03 Tornadoes are usually preceded by severe thunderstorms with frequent lightning, heavy rains, and strong winds. A severe thunderstorm or tornado watch announcement on the radio or television indicates that a severe thunderstorm or tornado is possible. Work will continue at the work site during severe thunderstorm or tornado watches. A severe thunderstorm or tornado warning signifies that a severe thunderstorm or tornado has been sighted or detected by radar and may be approaching. All on-site work will cease during a thunderstorm, severe thunderstorm warning, or tornado warning.

9.5.4.04 Personnel on site during a tornado will take the following steps.

- Evacuate office trailers or vehicles.
- Stay away from power poles, electrical appliances, and metal objects.
- If outdoors, lie flat in a ditch.
- Do not try to outrun a tornado.

9.5.5 Spill Response

Site operations should not involve handling large containers of hazardous waste that could be easily spilled; however, small containers (5 gallons or less) of gasoline, solvent, or diesel fuel may be used and stored on site. If material from these containers is spilled, EEG personnel will follow these steps.

- Evacuate the immediate area and extinguish ignition sources.
- The EEG UXOQC/SO will evaluate the situation to ensure that it is safe for personnel to begin cleanup operations.
- Using non-sparking or appropriately grounded tools, collect the contaminated soil and place it into a plastic bag, which will then be placed into a 55-gallon Department of Transportation (DOT)-approved drum.
- The EEG UXOQC/SO will notify the CEHNC site representative that the spill occurred and await guidance on disposal of the drummed contaminants.

9.5.6 Material Safety Data Sheets

MSDSs include valuable information for the treatment of exposure to chemicals, response to fires, chemical properties, chemical reactivity, toxicity, hazard classifications, and response to discharge. MSDSs will be posted on site for all materials and are included in Attachment B.

9.6 Confined Space Entry

9.6.01 According to 29 CFR 1910.146, a confined space is defined as having all of the following criteria:

- It is not large enough nor configured so that an employee can bodily enter and perform assigned work.
- It is not designed for continuous human occupancy.
- It has limited or restricted means for entry or exit.

9.6.02 Confined space entry is not anticipated as part of the site surface clearance operations; however, if an excavation meets all three of these criteria, it must be defined as a confined space, and the provisions and safety precautions of the EEG SSHSP will apply.

9.7 Spill Containment

In the event of a spill, an absorbent material will be used to contain the spill and absorb the excess liquid. After the excess liquid has been absorbed, the saturated absorbent will be placed in an appropriate sized steel drum for later disposal. Contaminated soil beneath the spill will also be immediately excavated and placed in drums.

9.8 Heat Stress

Heat stress is one of the most common (and potentially serious) illnesses that can affect hazardous waste site workers. The most common cause of heat stress during site activities is the effect that PPE has on the body's natural cooling mechanisms. Impermeable PPE interferes with perspiration evaporation and causes the body to retain metabolic and environmentally induced heat. Individuals will vary in their susceptibility and degree of response to the stress induced by increased body heat. Factors that may predispose a worker to heat stress include lack of physical fitness, lack of acclimatization to hot environments, degree of hydration, level of obesity, current health status (e.g., having an infection, chronic disease, or diarrhea), alcohol or drug use, and the worker's age and sex. For the remainder of this section, reference to liquids will indicate water or an electrolyte replacement solution, not tea, coffee, or soft drinks.

9.8.1 Heat Stress Disorders

9.8.1.1 Heat Rash

Heat rash is caused by continuous exposure to heat and humid air, and it is aggravated by wet, chafing clothes. This condition can decrease a worker's ability to tolerate hot environments.

- Symptoms

  Mild red rash, especially in areas of the body that sweat heavily.

- Treatment

  Decrease amount of time in protective gear and provide powder such as cornstarch or baby powder to help absorb moisture and decrease chafing. Maintain good personal hygiene standards and change into dry clothes if needed.

9.8.1.2 Heat Cramps

Heat cramps are caused by a perspiration rate that is not balanced by adequate fluid and electrolyte intake. Heat-related cramps are often an indication that excessive water and electrolyte loss has occurred, which can further develop into heat exhaustion or heat stroke.

- Symptoms

  Acute painful spasms of voluntary muscles such as the back, abdomen, and extremities.

- Treatment

  Remove victim to a cool area and loosen restrictive clothing. Stretch and massage affected muscles to increase blood flow to the area. Have victim drink 1 to 2 cups of liquids immediately and every 20 minutes thereafter. If available, an electrolyte replacement solution should be taken along with water. Soft drinks are inadequate and may aggravate the condition. Consult a physician if condition does not improve.

9.8.1.3 Heat Exhaustion

Heat exhaustion is a state of definite weakness or exhaustion caused by excessive fluid loss from the body. This condition leads to inadequate blood supply and cardiac insufficiency. Heat exhaustion is less dangerous than heat stroke but nonetheless must be treated. If allowed to go untreated, heat exhaustion can quickly develop into heat stroke.

- Symptoms

  Pale or flushed, clammy, moist skin, profuse perspiration, and extreme weakness. Body temperature is basically normal or slightly elevated, the pulse is weak and rapid, and breathing is shallow. The individual may have a headache and be dizzy or nauseated.

- Treatment

  Remove the individual to a cool, air-conditioned place, loosen clothing, elevate feet 8 to 12 inches, and allow individual to rest. Consult physician, especially in severe cases. Fan the individual and apply cool, wet cloths or rubbing alcohol. Give sips of cool water, half a glass every 15 minutes for one hour. The individual should do no work for several days.

9.8.1.4 Heat Stroke

Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of the heat-regulating mechanisms of the body. Failure of the individual's temperature control mechanism causes the perspiration system to stop working correctly. When this occurs, the body core temperature rises rapidly to a point (105+°F) where brain damage and death will result if the person is not cooled quickly.

- Symptoms

  The individual's skin is hot and may or may not be red and dry because the individual may still be wet from perspiration while wearing protective clothing earlier. Symptoms include nausea, dizziness, confusion, extremely high body temperature, rapid respiratory and pulse rates, delirium, convulsions, unconsciousness, or coma.
- Treatment

  Immediately cool the individual. If the body temperature is not lowered, place the individual in cool water to reduce the core temperature to a safe level (less than 102°F). If the individual is conscious, provide cool liquids to drink, but not caffeine or alcoholic beverages. Observe the individual and obtain immediate medical help.

9.8.2 Preventive Heat Stress Measures

To avoid heat-related illnesses, proper preventive measures will be implemented whenever environmental conditions dictate the need.

9.8.2.1 Minimal Preventive Measures

The following minimal steps will be taken.

- The UXOQC/SO will examine each site worker prior to the start of daily operations to determine the individual's susceptibility to heat stress. The UXOQC/SO will closely monitor workers exhibiting factors that make them susceptible to heat stress.
- Site workers will be trained to recognize and treat heat-related illnesses. This training will include the signs, symptoms, and treatment of heat stress disorders.

- Workers will be encouraged to drink a minimum of 16 ounces of liquids prior to start of work in the morning, after lunch, and prior to leaving the site at the conclusion of the day's activities. Disposable cups and liquids will be provided on site. Acceptable liquids will include water and an electrolyte replacement solution, with the intake of each being equally divided. Liquids containing caffeine should be avoided.
- When ambient conditions and site work load requirements dictate, as determined by the UXOQC/SO, workers will be required to drink a minimum of 16 to 32 ounces of liquids during each rest cycle.
- Personnel conducting site clearance operations will be provided camel-paks.
- A shelter or shaded area will be provided where workers may be protected from direct sunlight during rest periods.
- Monitoring of ambient or physiological heat stress indices will be conducted to allow prevention and/or early detection of heat-induced stress.
- Site workers will be given time to acclimatize to working in hot environments. Acclimatization usually takes 2 to 6 days and allows the worker's body to become adjusted to working in hot environments. This process involves a gradual increase of the workload over the 2-to-6-day period. The recommended acclimatization schedule suggests starting workers at 50 percent of the anticipated workload and increasing each day by 10 percent. For fit or trained individuals, the acclimatization period may be shortened to 2 or 3 days.

9.8.2.2 Additional Preventive Measures

When possible and/or feasible, the following measures will also be implemented to prevent or reduce the effects of heat-induced stress.

- Designated rest areas should be air-conditioned and the temperature maintained between 72°F and 76°F.
- Cooling devices will be provided to aid in body heat exchange. Cooling devices may include cooling jackets, vests, or suits and field showers or hose-down areas. Depending on the severity of the heat exposure, some form of artificial cooling may be required to ensure protection of the workers.
- Workers will be encouraged to achieve and maintain an optimum level of physical fitness. Increased physical fitness will allow workers to better tolerate and respond to hot environments and heavy workloads. In comparison to an unfit person, a fit person will

have less physiological strain, a lower heart rate and body temperature, and a more efficient sweating mechanism.

9.8.3 Physiological Heat Stress Monitoring

When site personnel are engaged in site activities involving the use of semi-permeable or impermeable clothing in ambient temperatures greater than 70°F, physiological monitoring will be conducted. The goal of all heat stress monitoring is to ensure that the worker's body temperature does not exceed 100.4°F. The following physiological monitoring methods are to be implemented based on the severity of the heat and workload. At minimum, the UXOQC/SO will monitor the worker's heart rate as an indication of potential heat stress; however, if monitoring with the heart rate method indicates the need for closer, more direct monitoring, the oral temperature method will be implemented. The UXOQC/SO will determine the need for monitoring body water loss based on the observation of sweat loss experienced by site personnel during their work cycle. The frequency of physiological monitoring will be determined using the information presented in **Table 9-3**.

Table 9-3. Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers

Adjusted Temperature[a]	Normal Work Ensemble[b]	Impermeable Ensemble
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5–90°F (30.8–32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5–87.5°F (28.1–30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5–82.5°F (25.3–28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5–77.5°F (22.5–25.3°C)	After each 150 minutes of work	After each 120 minutes of work

For work levels of 250 kilocalories per hour

a = Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F = ta °F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate % sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow (e.g., 100% sunshine = no cloud cover and a sharp, distinct shadow; 0% sunshine = no shadows). Use decimal expression of percent sunshine.

b = A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

Source: NIOSH/OSHA/US Coast Guard (USCG)/EPA. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. DHHS (NIOSH) 85-115. Cincinnati, OH.

9.8.3.1 Heart Rate Monitoring

The worker's baseline heart rate should be recorded prior to starting site activities by measuring the radial (wrist) pulse rate for 30 seconds. After each work cycle, the heart rate should be measured by taking the pulse rate as early as possible into the resting period. Taking the radial pulse rate is the preferred method; however, the carotid (neck) pulse rate may be taken if a worker

has difficulty finding the radial pulse. The pulse rate at the beginning of the rest period should not exceed 110 beats per minute (bpm). If the pulse rate is higher than 110 bpm, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate exceeds 110 bpm at the beginning of the next rest period, the work cycle should be further shortened by 33 percent. This procedure is continued until the pulse rate at the beginning of the rest cycle is maintained below 110 bpm.

9.8.3.2 Oral Temperature Monitoring

If deemed necessary by the UXOQC/SO, and the conditions warrant, oral temperature (OT) monitoring will be conducted. Prior to starting site activities, the worker's OT will be taken with a clinical thermometer placed under the tongue and recorded. The OT must be taken prior to the consumption of cool liquids and will be done at the end of each work period or at a frequency determined by **Table 9-3**. Whenever the OT exceeds 99.6°F, the work cycle must be shortened by one third without changing the length of the rest period. If a worker's OT has exceeded 99.6°F, the OT should be tested again at the end of the rest cycle, and the worker should not be allowed to return to work until the OT drops below 99.6°F. If a worker's OT exceeds 100.4°F, the worker will not be allowed to work in impermeable or semi-permeable PPE for the remainder of that work day.

9.8.3.3 Body Weight Loss

If expected site conditions and work requirements have the potential for causing excessive fluid loss, the UXOQC/SO will monitor workers' fluid loss by weighing each worker prior to and again at the conclusion of each day's site activities. This will be needed to ensure that proper hydration is being maintained and that the total amount of water weight loss throughout the day does not exceed 1.5 percent of the employee's body weight. Body weights will be taken with the workers wearing undergarments only. If, as determined by the UXOQC/SO, site conditions and work requirements cause an extreme amount of fluid loss, body weights will also be taken prior to lunch break. Calculating the water weight loss and assessing the effectiveness of hydration shall be conducted as follows.

1. Subtract the ending weight (W_{ending}) from the daily starting weight (W_{start}) to obtain the weight lost (W_{lost}) during a given work period [i.e., (W_{start}) – (W_{ending}) = (W_{lost})].
2. Multiply the starting weight by 1.5 percent to obtain permissible weight loss (W_{perm}) [i.e., (W_{start}) x 0.015 = (W_{perm})].

3. Compare (W_{lost}) to the (W_{perm}). If (W_{lost}) is less than or equal to (W_{perm}), then hydration has been adequate, but if (W_{lost}) is greater than (W_{perm}), then hydration should be increased during the next work period.

9.8.3.4 Wet Bulb Globe Temperature Monitoring

For site conditions where personnel are working in Level D PPE and the ambient temperature is greater than 75°F, the UXOQC/SO will conduct WBGT monitoring to help control the potential for site workers experiencing heat-related adverse health affects. The UXOQC/SO will use a real-time direct-reading WBGT monitor and, after estimating the workload, use the threshold limit values (TLVs) expressed in **Table 9-4** to determine the work/rest schedule to be implemented (a TLV reflects the level of exposure that the typical worker can experience without an unreasonable risk of disease or injury). The values in **Table 9-4** are designed such that nearly all acclimatized and fully clothed workers with adequate salt and water intake will be able to function without the body temperature exceeding 100.4°F. If conditions and/or workloads warrant, the UXOQC/SO may also implement the OT and water-weight-loss monitoring outlined above.

Table 9-4. Permissible WBGT Heat Exposure Threshold Limit Values

Work / Rest Regimen	Work Load*		
	Light	Moderate	Heavy
Continuous work	86°F (30.0°C)	80°F (26.7°C)	77°F (25.0°C)
75% work, 25% rest each hour	87°F (30.6°C)	82°F (28.0°C)	78°F (25.5°C)
50% work, 50% rest each hour	89°F (31.4°C)	85°F (29.4°C)	82°F (27.9°C)
25% work, 75% rest each hour	90°F (32.2°C)	88°F (31.1°C)	86°F (30.0°C)

*Consult the ACGIH TLV booklet for definitions of light, moderate, and heavy workloads.

Values are given in °F and °C WBGT, and are intended for workers wearing single-layer summer-type clothing. Use of semi- or totally impermeable clothing requires monitoring (see 9.8.3, Physiological Heat Stress Monitoring). As work load increases, the heat stress impact on an un-acclimatized worker is exacerbated. For un-acclimatized workers performing a moderate level of work, the permissible heat exposure TLV should be reduced by approximately 2.5°C.

Source: ACGIH 1993-1994 TLV and Biological Exposure Indices, Cincinnati, OH.

9.8.4 Heat Stress Documentation

The UXOQC/SO will be responsible for recording all heat stress-related information. This will include training sessions and WBGT and physiological monitoring data, and will be recorded on the Wet Bulb Globe Temperature Log and Heat Stress Monitoring Log.

10.0 Standard Operating Procedures and Safe Work Practices

10.0.01 This paragraph outlines the site standing orders that site personnel will obey at all times. The safe work practices address the safety and health precautions related to specific hazards that may be encountered during site operations. Using common sense and following safe work practices can reduce hazards encountered during normal site activities. The following practices are not allowed:

- Running and horseplay
- Smoking, eating, or chewing tobacco while in the WZ or any potentially contaminated area
- Igniting flammable materials in the WZ (equipment will be bonded, grounded, and explosion-resistant, as appropriate)
- Performing tasks in the restricted area individually (i.e., working alone); personnel will be required to work using the buddy system at all times

10.0.02 Personnel must keep the following guidelines in mind when conducting field activities.

- Hazard assessment is a continuous process. Personnel must constantly be aware of their surroundings and the chemical and physical hazards that are or may be present.
- Team members will be familiar with the physical characteristics of each site, including site access and the location of communication devices and safety equipment.
- The location of overhead power lines and underground utilities must be established.

10.1 Heavy Equipment Operation

Heavy equipment used on site will be operated under strict adherence to the applicable OSHA regulations found in 29 CFR 1910 and 29 CFR 1926 and the following guidelines.

- The operation of heavy equipment will be limited to authorized personnel specifically trained in its operation.
- The operator will visually inspect heavy equipment daily prior to operation and report any abnormalities or deficiencies to the UXOQC/SO.
- The operator will use the safety devices provided with the equipment, including seat belts, backup warning indicators, and horns, which will be operable at all times.
- While heavy equipment is in operation, all personnel not directly required to be in the area will keep a safe distance from the equipment.

- The operator's cab will be kept free of all non-essential items, and all loose items will be secured.
- Personnel will avoid moving into the path of operating equipment and areas blinded from the operator's vision.
- When heavy equipment must negotiate tight quarters, or if the operator of earth-moving equipment cannot see the bucket, a second person will be stationed to guide the operator.
- Additional riders will not be allowed on equipment unless it is specifically designed for that purpose (i.e., there is an additional seat with a seat belt).
- Personnel operating heavy equipment will use hearing protection.
- The unit or equipment will be shut down before refueling.

10.2 Power Tools

Power tools have great capability for inflicting serious injury if they are not properly used and maintained. To control the hazards associated with power tool operation, the following safe work practices shall be observed when using power tools.

- Authorized personnel familiar with the tool, its operation, and safety precautions will conduct operation.
- Power tools will be inspected prior to use, and defective equipment will be removed from service until repaired.
- Power tools designed to accommodate guards will have such guards properly in place prior to their use.
- Loose-fitting clothing or long hair will not be permitted around moving parts.
- Hands, feet, etc. will be kept away from all moving parts.
- The power will be disconnected prior to maintenance and/or adjustments to the equipment.
- An adequate operating area will be provided, allowing sufficient clearance and access for operation.
- Electrical tools will be operated in accordance with the applicable specifications.
- Good housekeeping practices will be followed at all times.

10.3 Hand Tools

Use of improper or defective tools can significantly contribute to on-site accidents. The following safe work practices shall be observed when using hand tools.

- Inspect hand tools for defects prior to each use.
- Remove defective hand tools from service and repair or properly discard them.
- Select and use tools in the manner for which they were designed.
- Be sure of safe footing and grip before using any tool.
- Do not use tools that have split handles, mushroom heads, worn jaws, or other defects.
- Wear gloves whenever they increase gripping ability, or if cut, laceration, or puncture hazards may exist during the use of hand tools.
- Wear safety glasses or a face shield if use of tools presents an eye or face hazard.
- Do not use makeshift tools or other improper tools.
- When working overhead, secure tools to ensure that they cannot fall on someone below.
- Use non-sparking tools in the presence of explosive vapors, gases, or residue.
- If hand tools become contaminated, properly decontaminate, bag, mark, and hold the tools for disposition.

10.4 Excavations and Confined Spaces

Not applicable

10.5 Material Lifting

10.5.1 General Requirements

Care should be taken in lifting and handling heavy or bulky items because they are the cause of many joint and back injuries. If needed, EEG will provide back support devices to aid in preventing back injury during lifting activities. The following fundamentals address the proper lifting of materials to avoid joint and back injuries.

- The size, shape, and weight of the object to be lifted must be considered. Site personnel will not lift more than they can comfortably handle. Individual workers should not normally lift loads in excess of 40 pounds.
- A firm grip on the object is essential; therefore, the hands and object shall be free of oil, grease, and water, which might prevent a firm grip.
- The hands and fingers shall be kept away from any points that cause them to be pinched or crushed, especially when setting down the object.
- The item shall be inspected for metal slivers, jagged edges, burrs, rough or slippery surfaces, and pinch points, and gloves shall be used, if necessary, to protect the hands.
- The feet shall be placed far enough apart for good balance and stability.

- Personnel will ensure that solid footing is available prior to lifting the object.
- To lift the object, the individual shall bend the legs at the knees and get as close to the load as possible, making sure that the back is kept as straight as possible; the legs are then straightened from their bent position.
- To place the object down, the stance and position are identical to that for lifting, with the back kept straight and the legs bent at the knees.
- Personnel shall not carry a load that cannot be seen over or around.

10.5.2 Two-Person Lifting

When two or more people are required to handle an object, coordination is essential to ensure that the load is lifted uniformly and that the weight is equally divided between the individuals carrying the load. When carrying the object, each person, if possible, shall face the direction in which the object is being carried.

10.6 Electrical Hazards

Electrical wiring and apparatus safety procedures will be conducted in accordance with OSHA Standard 29 CFR 1910.137(2). These requirements include but are not limited to the following.

- All electrical wiring and equipment will be of a type listed by Underwriters Laboratories, Inc. (UL) or Factory Mutual Engineering Corp (FMEC) for the specific application.
- All installations will comply with National Electrical Safety Code (NESC) or National Electric Code (NEC) regulations.
- Personnel familiar with and qualified for the class of work to be performed will accomplish all work.
- Live parts of wiring or equipment will be guarded to protect all individuals or objects from harm.
- Electrical wire or flexible cord passing through work areas will be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, or pinching.
- Temporary power lines, switch boxes, receptacle boxes, metal cabinets, and enclosures around equipment will be marked to indicate the maximum operating voltage.
- Patched, oil-soaked, worn, or frayed electrical cords or cables will not be used.
- Portable hand lamps will be of the molded composition type or other type approved for the purpose, and hand lamps will be equipped with a handle and a substantial guard over the bulb that is attached to the lamp holder or the handle.

- Extension cords or cables will not be fastened with staples, hung from nails, or suspended by wire.
- All electrical circuits will be grounded in accordance with NEC and NESC standards unless otherwise noted in the reference manuals.
- A multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle will ground portable and semi-portable electric tools and equipment.
- Semi-portable equipment, floodlights, and work lights will be grounded, and the protective ground will be maintained during moving, unless supply circuits are de-energized.
- Tools protected by an approved system of double insulation or its equivalent need not be grounded.
- UL-listed ground-fault circuit interrupters (GFCIs), calibrated to trip within the threshold values of 5 milliamperes (mA) $\pm$1 mA, are required on all circuits used for portable electric tools.
- In instances where the GFCI is sensitive to equipment vibration, the UXOQC/SO will ensure proper equipment grounding prior to the equipment being used.
- Flexible cord sets will be UL-listed, contain the number of conductors required for the service plus an equipment ground wire, and classified as hard usage or extra hard usage (identified by "outdoor" or "WA" printed on the jacket).
- Bulbs attached to festoon lighting strings will be protected by wire guards or equivalent unless deeply recessed in a reflector.
- Temporary wiring will be guarded, buried, or isolated by elevation to prevent accidental contact by workers or equipment.

10.7 Ladders

Accidents and injuries associated with ladders are frequent and usually severe in nature; therefore, the following safe work practices, along with any of the specialized requirements listed in 29 CFR 1926.1053(b), will be followed whenever ladders are used on site. The UXOQC/SO will be responsible for identifying and communicating any additional requirements related to ladder use during a given task.

- In accordance with 29 CFR 1926.1060, personnel using ladders shall receive training by the UXOQC/SO in the safe inspection, erection, use, and maintenance of the ladders to be used on site.

- Manufactured ladders will be constructed of heavy-duty-grade material, and they will be American National Standards Institute (ANSI)-approved.
- Ladders will be inspected prior to each use by the UXOQC/SO to ensure safe working condition, and defective ladders will be removed from service.
- The area around the top and bottom of a ladder will be kept clear of obstructions and debris.
- Ladders will not be spliced together to make a longer ladder.
- Straight ladders for egress will extend at least 3 feet above the landing and will be secured.
- The base of a straight ladder will be set back from the vertical surface a distance of approximately one-fourth the working height of the ladder.
- A stepladder will be fully opened to permit the spreader to lock, and it will not be closed or leaned against an object for access.
- Metal ladders will not be used for electrical work or in areas where they could contact energized wiring.
- Ladders will be maintained free of grease, oil, or other slipping hazards.
- Job-made ladders will be constructed and used in accordance with OSHA 1926.1053.

10.8 Fire Hazards

Although fires and explosions may arise spontaneously, they are more commonly the result of carelessness during site activities such as moving drums and mixing or bulking of site chemicals, and during the refueling of heavy or hand-held equipment. Some potential causes of explosions and fires include:

- Mixing of incompatible chemicals that cause reactions that spontaneously ignite due to the production of flammable vapors and heat
- Ignition of explosive or flammable chemical gases or vapors by external ignition sources
- Ignition of materials due to oxygen enrichment
- Agitation of shock or friction-sensitive compounds
- Sudden release of materials under pressure

10.8.1 Fire Prevention

Explosions and fires not only pose the obvious hazards of intense heat, open flames, smoke, and flying objects but they may also cause the release of toxic chemicals into the environment. Such

releases can threaten personnel on site and members of the general public living or working nearby. The following guidelines to prevent fires and explosions apply to site personnel involved with potentially flammable materials or operations.

- Potentially explosive or flammable atmospheres involving gases or vapors will be monitored using a combustible gas indicator.
- Entry will not be made into any confined space in which the lower explosive limit (LEL) is found to be greater than 20 percent or when the oxygen content is less than 21 percent.
- Prior to initiation of site activities involving explosive or flammable materials, all potential ignition sources will be removed or extinguished.
- Non-sparking and explosion-proof equipment will be used whenever the potential exists for ignition of flammable or explosive gases, vapors, or liquids.
- Dilution or induced ventilation may be used to decrease the airborne concentration of explosive or flammable atmospheres.
- Smoking will be prohibited at or in the vicinity of operations that may present a fire hazard, and the area will be conspicuously posted with signs stating "No Smoking or Open Flame Within 50 Feet."
- Flammable and/or combustible liquids must be handled only in approved and properly labeled metal safety cans equipped with flash arresters and self-closing lids.
- Transfer of flammable liquids from one metal container to another will be made only when the containers are electrically interconnected (bonded).
- Motors of equipment being fueled will be shut off during the fueling.
- Metal drums used for storing flammable or combustible liquids will be equipped with self-closing safety faucets, vent bung fittings, grounding cables, and drip pans, and they will be stored outside of buildings in an area approved by the UXOQC/SO.

10.8.2 Fire Protection

The following safe work practices will be used to protect the site and site personnel against the hazards of fires.

- Flammable or combustible liquid storage areas will have at least one 4A:20:B:C: fire extinguisher located within 25 to 75 feet.
- All earth-moving equipment (e.g., backhoes, bulldozers, and drill rigs) will be equipped with a fire extinguisher of not less than 10:B units or higher.

- All vehicles used in the transport of explosives will be equipped with two fire extinguishers of not less than 10:B units or higher, with one fire extinguisher mounted or placed inside the cab of the vehicle and one mounted outside by the driver's side door, if possible.
- Temporary offices will be equipped with a fire extinguisher of not less than 10:B units or higher.
- At least one portable fire extinguisher having a rating of not less than 20:B units will be located at each work site.

10.9 Biological Hazards

Biological hazards usually found on site include hazardous plants, stinging and biting insects, and snakes, ticks, and spiders. Employee awareness of the following safe work practices should reduce the risk associated with these hazards.

10.9.1 Hazardous Plants

A large number and variety of hazardous plants may be encountered during site activities. The ailments associated with these plants range from mild hay fever and contact dermatitis to carcinogenic affects; however, the plants that present the greatest degree of risk (i.e., potential for contact versus affect produced) to site personnel are those that produce skin reactions and skin and tissue injury.

10.9.1.1 Plants Causing Skin and Tissue Injury

Contact with splinters, thorns, and sharp leaf edges is of special concern to site personnel, as is the contact with the pointed surfaces found on branches, limbs, and small trunks left by site clearing and grubbing crews. Acacia thorns may be particularly prevalent on sites such as Cerro Balcon. This concern stems from the fact that punctures, cuts, and minor scrapes caused by accidental contact may result in non-infectious skin lesions, and fungi or bacteria may be introduced through the skin or eye. This is especially important because the warm, moist environment created inside impermeable protective clothing is ideal for the propagation of fungal and bacterial infection. Personnel receiving any of these injuries, even minor scrapes, should immediately report to the UXOQC/SO for initial and continued observation and care of the injury.

10.9.1.2 Plants Causing Skin Reactions

10.9.1.2.01 Poisonous plants such as manzanillo may be encountered at this site. The manzanillo is a tree growing to a height of 40 to 50 feet, mostly on sandy seashores, said to be so poisonous that men die under the shade of it. It has shiny green leaves with stalked elliptical edges that cut like saw teeth, a single gland on the upper side where the stalk and leaf join, and very small inconspicuous flowers (of separate sexes) on long slender spikes, the few females placed singly at base of the spike with a three-parted calyx, the males in little clusters on the upper part with a two-parted calyx and two or four stamens joined by their filaments, the females with a many-celled ovary crowned with from four to eight styles and re-flexed stigmas. The fruit is a rounded fleshy yellow-green berry. The hazardous components of the manzanillo are the milky, very acrid juice in both the bark and the berries.

10.9.1.2.02 The skin reaction associated with contacting these plants is caused by the body's allergic reaction to toxins contained in oils produced by the plant. Contamination can be achieved through contact with the leaves, branches, stems, or berries, or contact with contaminated items such as tools and clothing. The allergic reaction associated with exposure to these plants will generally cause the following signs and symptoms:

- Blistering at the site of contact, usually occurring within 12 to 48 hours after contact
- Reddening, swelling, itching and burning at the site of contact
- Pain, if the reaction is severe
- Conjunctivitis, asthma, and other allergic reactions if the person is extremely sensitive to the poisonous plant toxin

10.9.1.3 Preventive Measures

- Avoid contact with any poisonous plants on site, and keep a steady watch to identify, report, and mark poisonous plants found on site.
- Wash hands, face, or other exposed areas at the beginning of each break period and at the end of each workday.
- Avoid contact with, and wash on a daily basis, contaminated tools, equipment, and clothing.
- Try barrier creams, detoxification or wash solutions, and orally administered desensitization to find the best preventive solution.

10.9.2 Snakes

10.9.2.01 No poisonous snakes are anticipated on Culebra or surrounding cays; however, snake bites should be treated by a physician to prevent infection and complications.

10.9.2.02 When site activities are conducted in warm weather in wooded, grassy, or rocky environments, the potential for contact with poisonous snakes becomes a real danger. The noise created by a person approaching a snake is usually sufficient to frighten off the snake; however, during the warm months, extreme caution must be exercised when conducting site operations around areas where snakes might be found (i.e., rocks, bushes, logs, or in holes, crevices, and abandoned pipes). If poisonous snakes are identified on site, EEG will issue protective clothing such as snake leggings to site personnel.

10.9.2.03 The following rules apply to snake bites.

- Do not cut "Xs" over the bite area because this will intensify the effect of the venom.
- Do not apply suction to the wound, since this has a minimal effective in removing venom.
- Do not apply a tourniquet, since this will concentrate the venom and increase the amount of tissue damage in the immediate area.
- If possible, kill the snake, bag it, and transport it with the victim, or try to get a good look at it so it can be identified for the proper selection of anti-venom.
- Do not allow the victim to run for help, since running increases the heart rate and will increase the spread of the venom throughout the body.
- Keep the victim calm and immobile.
- Have the victim hold the affected extremity lower than the body while waiting for medical assistance.
- Immediately transport the victim to medical attention.

10.9.3 Ticks

10.9.3.01 The Centers for Disease Control (CDC) has noted the increase of lyme disease and Rocky Mountain spotted fever, which are caused by bites from infected ticks that live in and near wooded areas, tall grass, and brush. Ticks are small, ranging in size to about 0.25 inch. They are sometimes difficult to see; when embedded in the skin, a tick may look like a freckle. The tick season extends from spring through summer.

10.9.3.02 Lyme disease has occurred in 43 states, with the heaviest concentrations in the northeast (Connecticut, Massachusetts, New Jersey, New York, Pennsylvania), the upper midwest (Minnesota and Wisconsin), and along the Northern California coast. It is caused by deer ticks and lone star ticks that have become infected with spirochetes. Female deer ticks are about 0.25 inches in size and are black and brick red in color. Male deer ticks are smaller and completely black. Lone star ticks are larger and chestnut brown in color.

10.9.3.03 Rocky Mountain spotted fever has occurred in 36 states, with the heaviest concentrations in Oklahoma, North Carolina, South Carolina, and Virginia. It is caused by Rocky Mountain wood ticks and dog ticks that have become infected with rickettsia. Both are black in color.

10.9.3.04 The first symptoms of either disease are flu-like chills, fever, headache, dizziness, fatigue, stiff neck, and bone pain. If immediately treated by a physician, most individuals fully recover in a short period of time. If not treated, more serious symptoms can occur. If a team member believes that a tick has bitten him or exhibits any of the signs and symptoms, the team member should contact the UXOQC/SO, who will then authorize a visit to a physician for an examination and possible treatment.

10.9.3.1 Protective Measures

Standard field gear (i.e., work boots, socks, and light-colored coveralls) provides good protection against tick bites, particularly if the joints are taped; however, even when wearing field gear, the following precautions should be taken when working in areas that might be infested with ticks.

- Spray outer clothing, particularly pant legs and socks, **BUT NOT YOUR SKIN**, with an insect repellant that contains permethrin or permanone. Allow the permethrin to dry before using the treated clothing. Apply vapor-active repellant containing DEET (N,n-diethyl-m-toluamide) to any exposed skin surface (except eyes and lips).
- In the field, check often for ticks, particularly on lower legs and areas covered with hair.
- In wooded areas, avoid contact with bushes, tall grass, or brush as much as possible.
- If you find a tick, remove it by pulling on it gently with tweezers.
- If the tick resists, cover the tick with salad oil for about 15 minutes to asphyxiate it, then remove it with tweezers.
- Do not use matches, a lit cigarette, nail polish, or any other type of chemical to coax the tick out.

- Remove all parts of the tick's body and disinfect the area with alcohol or a similar antiseptic after its removal.
- For several days to several weeks after removal of the tick, look for signs of the onset of lyme disease, such as a rash that looks like a bull's-eye or an expanding red circle surrounding a light area, frequently seen with a small welt in the center.
- Also look for the signs of the onset of Rocky Mountain spotted fever, such as an inflammation that is visible in the form of a rash comprising many red spots under the skin, which appears 3 to 10 days after the tick bite.

10.9.4 Bees, Hornets, and Wasps

10.9.4.01 Contact with stinging insects such as bees, hornets, and wasps may result in site personnel experiencing adverse health affects that range from mildly uncomfortable to life-threatening; therefore, stinging insects present a serious hazard to site personnel, and extreme caution must be exercised whenever site and weather conditions increase the risk of encountering stinging insects.

10.9.4.02 Some of the factors related to stinging insects that increase the degree of risk associated with accidental contact are as follows.

- The nests for these insects are frequently found in the type of remote wooded grassy areas where many waste sites are located.
- The nests can be situated in trees, rocks, bushes, or in the ground, and they are usually difficult to see.
- Accidental contact with these insects is highly probable, especially during warm weather conditions when the insects are most active.
- If a site worker accidentally disturbs a nest, the worker may be inflicted with multiple stings, causing extreme pain and swelling that can leave the worker incapacitated and in need of medical attention.
- Some people are hypersensitive to the toxins injected by a sting and experience a violent and immediate allergic reaction resulting in a life-threatening condition known as anaphylactic shock. Anaphylactic shock manifests itself rapidly and is characterized by extreme swelling of the body, eyes, face, mouth, and respiratory passages. In some people, the hypersensitivity that causes anaphylactic shock can accumulate over time and exposure; therefore, the fact that someone was stung previously and did not experience an

allergic reaction does not guarantee that he or she will not have an allergic reaction after being stung again.

10.9.4.03 Because of the high probability of contact with stinging insects, all site personnel will comply with the following safe work practices.

- If a worker knows that he or she is hypersensitive to bee, wasp, or hornet stings, he or she must inform the UXOQC/SO of this condition prior to participation in site activities.
- All site personnel will be watchful for the presence of stinging insects and their nests and will advise the UXOQC/SO if a stinging insect nest is located or suspected in the area.
- Any nests located on site will be flagged, and site personnel will be notified of their presence.
- If stung, site personnel will immediately report the UXOQC/SO to obtain treatment and to allow the UXOQC/SO to observe them for signs of allergic reaction.
- Site personnel with a known hypersensitivity to stinging insects will keep required emergency medication on or near their person at all times.

10.9.5 Biting Insects

Biting insects such as mosquitoes, flies, and fleas may be encountered on site. The use of insect repellents will be encouraged by the UXOQC/SO if deemed necessary. Mosquito-transmitted diseases include Dengue fever, which may prove deadly in one of its varieties.

10.9.6 Spiders, Scorpions, and Centipedes

10.9.6.01 Spider bites, especially those of the black widow and the brown recluse, can cause significant adverse heath affects, and no effective first-aid treatment exists for either of these bites. Except for very young, very old, or weak victims, these spider bites are not considered to be life-threatening, but medical treatment must be sought to reduce the extent of damage caused by the injected toxins. If either of these spiders are suspected or known to be on site, the UXOQC/SO will brief the site personnel on identification and avoidance of the spiders. As in the case of stinging insects, site personnel should report to the UXOQC/SO if they locate either of these spiders on site or if they notice any type of bite while involved in site activities.

10.9.6.02 The black widow is a coal-black bulbous spider 0.75 inch to 1.5 inches long, with a bright red hourglass shape on the underside of its abdomen. Black widows are usually found in dark, moist locations, especially under rocks and rotting logs, and may even be found in outdoor

toilets, where they inhabit the underside of the seat. Victims of a black widow bite may exhibit the following signs or symptoms:

- Sensation of pinprick or minor burning at the time of the bite
- Appearance of small punctures (but sometimes none are visible)
- After 15 to 60 minutes, intense pain at the site of the bite, which spreads quickly and is followed by profuse sweating, rigid abdominal muscles, muscle spasms, breathing difficulty, slurred speech, poor coordination, dilated pupils, and generalized swelling of the face and extremities

10.9.6.03 The brown recluse is brownish to tan in color, rather flat, and 0.5 to 0.625 (5/8) inch long, with a dark brown violin shape on the underside. It may be found in trees or in dark locations. Victims of a brown recluse bite may exhibit the following signs or symptoms:

- Blistering at the site of the bite, followed by a local burning at the site 30 to 60 minutes after the bite
- Formation of a large, red, swollen, pulsating lesion with a bull's-eye appearance
- Systemic effects such as a generalized rash, joint pain, chills, fever, nausea, and vomiting
- Possible severe pain after 8 hours, with the onset of tissue necrosis

10.9.6.04 Several dozen species of scorpions inhabit the Antilles. The sting of West Indian species can be painful, but none are known to be fatal to humans.

10.9.6.05 The sting of local centipedes is painful and may in rare cases require medical treatment.

10.9.7 Hanta Virus

10.9.7.01 Hanta virus was first recognized as a unique health hazard in 1993, with 158 cases reported as of March 17, 1997. Outbreaks have been limited principally to the Four Corners region of Arizona, New Mexico, Utah, and Colorado. Four different strains of hanta virus exist, and cases have been reported in 26 different states. The virus is most active when the temperature is between 45ºF and 72ºF. The virus dies quickly when exposed to sunlight.

10.9.7.02 Hanta virus is an airborne virus spread through the urine and feces of infected rodents. A person is infected with the virus by breathing in particles released into the air when infected rodents, their nests, or their droppings are disturbed. This can happen when a person is handling rodents, disturbing rodent nests or burrows, cleaning buildings where rodents have made

a home, or working outdoors. Symptoms of hanta virus infection include fever and muscle aches, nausea, diarrhea, dry non-productive cough, chills, vomiting, and abdominal pain.

10.9.7.03 Hanta virus is not expected to be encountered at this site, but the following precautions should be taken.

- Air out any closed sheds or buildings before entering.
- Make sure the buildings are properly sealed from rodent access.
- Trap until all mice are gone, using care to disinfect any trapped rodents.
- Clean up droppings only after the area has been disinfected.
- In areas of potential exposure, always wear a respirator that utilizes high efficiency particulate air (HEPA) rated filters.
- Dispose of all caught rodents, droppings, and nesting materials in an appropriate manner.

10.10 Munitions and Explosives of Concern

If MEC is located on site, its location will be marked and the on-site government representative will be notified of its presence. All UXO-qualified personnel will follow the safe work practices in the Work Plan, and all non-UXO-qualified personnel will comply with the following safe work practices.

- Non-UXO-qualified personnel will receive site-specific MEC recognition training prior to participation in site activities.
- No soil-penetrating activities will be allowed without the area first being cleared by UXO-qualified personnel.
- Non-UXO-qualified personnel will be escorted on site by UXO-qualified personnel until such a time that the area is cleared.
- Once an area has been cleared and flagged, non-UXO-qualified personnel may perform duties in the area unescorted, but they shall not leave the cleared area unescorted.
- No excavation or soil-penetrating activities will be conducted in an area unless previously cleared by UXO-qualified personnel.
- Non-UXO-qualified personnel will not touch or disturb any object that could potentially be MEC-related, and they will immediately notify the nearest UXO-qualified person of the presence of the object.

11.0 Safety Logs, Reports, and Recordkeeping

The following logs and records will be completed, retained, and submitted to the EEG site manager for compilation and included with the daily report. Copies of forms are provided in Appendix F of the Work Plan.

11.1 Safety Log

The EEG UXOQC/SO will maintain a safety log of all safety-related activities. The EEG UXOQC/SO is responsible for ensuring that safety and health activities for the day, as well as tailgate safety briefing minutes, are part of the log. When safety and health deficiencies are noted during daily inspections, then the measures, timetable, and individual responsible for correcting the deficiencies will be noted in the safety log.

11.2 Tailgate Safety Briefings and Training

The EEG UXOQA/SO is responsible for ensuring that all tailgate safety briefings and training conducted relative to job site activities is appropriately documented on the Tailgate Safety Briefing / Training Forms.

11.3 Visitor Log

A Visitor Log will be maintained at the entrance to all work sites to record visit to the job site.

11.4 Reports

The following reports will be submitted as required by applicable CEHNC and OSHA regulations.

- If a reportable injury, illness, or accident occurs at the job site, the appropriate form will be completed and forwarded within 24 hours to the EEG project manager. The Accident / Injury Investigation form will be completed for all accidents and illnesses that are work-related, as well as for near misses. If a serious accident occurs that results in lost days and/or damage in excess of $2,000, ENG Form 3394, in accordance with AR 385-40 and USACE supplements to that regulation, will be submitted to the EEG project manager for submittal to the CEHNC project manager.
- Daily reports will be submitted to the EEG project manager and will include Tailgate Safety Briefing / Training Form, accident reports, Visitor Log, and a description of safety activities, inspections, weather and site conditions, etc. that occurred during the day.

11.5 Recordkeeping

Site records will be kept in three-ring binders or in field notebooks. Additionally, site data will be kept on site in a database that will be updated daily. All recordkeeping will be in accordance with applicable OSHA and CEHNC standards and regulations.

ATTACHMENT B

Material Safety Data Sheets

THE SOMERSET REFINERY, INC

600 MONTICELLO ST.
P.O. BOX 1547
SOMERSET, KY 42502

Updated 10 Mar 2000
Bruce C. McGowan

MATERIAL SAFETY DATA SHEET

DieLsRd

EMERGENCY NUMBERS: ATSDR (24hr) (404) 639-0615 Somerset Refiner (606) 678-8194

I. PRODUCT IDENTIFICATION

PRODUCT: **Diesel Fuel, Road, Low Sulfur .05%** CHEMICAL NAM Petroleum Distillate

CHEMICAL FAMILY: Petroleum Hydrocarbon FORMULA: C10 - C | CAS #: 68476-30-2

NATIONAL FIRE PROTECTION ASSOCIATION RATING CODE:	HEALTH CODE: 1
	FIRE CODE: 2
LEAST (0), SLIGHT (1), MODERATE (2), HIGH (3), EXTREME (4)	REACTIVITY COD 1

II. COMPONENTS

INGREDIENT	%	OSHA LIMIT	TLV
#2 Diesel Fuel (CAS # 68476-30-2)	100	Not Established	Not Established
Aliphatic Hydrocarbons (CAS # 68476-34-6)	> 95		
SARA Title III, Section 313 Reportable Chemicals:			
Biphenyl (CAS # 92-52-4)	0.4 - 1.2		
Naphthalene (CAS # 91-20-3)	0.5 - 1.5	Note: The Permissible Exposure Limit (PEL/OSHA) for petroleum distllates is 200 mg/m3 . NIOSH has recommended a 10 hour TWA of 100 mg/m^3 for kerosene (1977).	
Xylene Mixture (CAS # 1330-20-7)	0.5 - 1.5		

III. PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT 330 - 760 ^{O}F	VAPOR PRESSURE < 1 mmHg @ 77^{O}F	EVAPORATION (Ethyl Ether = 1) < 1
VOLATILE BY VOLUME % 100	AVERAGE MOLAR MASS Varies	APPEARANCE Clear Straw Color Liquid
ODOR AND THRESHOLD Petroleum~500 ppm	MELTING POINT Not Applicable	DENSITY OF VAPOR (Air = 1) 5 - 6
SPECIFIC GRAVITY (Water = 1) 0.825 API Gravity - 40 @ 60^{O}F	VISCOSITY 4.3 cSt @ 100^{O}F	SOLUBILITY (g/100g Water @ 20^{O}C) Negligible

IV. FIRE PROTECTION INFORMATION

FLASH POINT / METHOD	AUTOIGNITION TEMPERAT	FLAMMABLE LIMITS (% Volume in Air)	
		LOWER	UPPER
145°F / COC	490°F or Higher	0.4	6.0

EXTINGUISHING MEDIA AND FIREFIGHTING PROCEDURES

Carbon dioxide, dry chemical, or foam. Water stream may spread fire, use water spray only to cool containers expose to fire. If leak or spill has not ignited, use water spray to disperse the vapors and flush spills away from sources of potential ignition. Do not enter enclosed or confined spaces without proper protective equipment including a full face self-contained breathing apparatus in the positive pressure demand mode when fighting fires.

HAZARDOUS DECOMPOSITION PRODUCTS

Dense smoke may be generated while burning. Products of combustion may contain carbon monoxide, carbon dioxide and other toxic materials.

FIRE AND EXPLOSION HAZARDS

Avoid undue exposure to air. Avoid heat, sparks and flame. Can form flammable mixtures with air. Explosion hazar in fire situation. Vapor heavier than air and may travel considerable distance to a source of ignition and flash back.

INCOMPATABILITY WITH OTHER MATERIALS

Incompatible or can react with strong oxidizers.

HAZARDOUS POLYMERIZATION	CHEMICAL STABILITY
[X] WILL NOT OCCUR [ ] WILL OCCUR	[X] STABLE [ ] UNSTABLE

V. HEALTH EFFECTS

INHALATION

Medical conditions aggravated by exposure: kidney, liver or blood disorders.
Acute effects: Possible effects include nasal and respiratory irritation, breathlessness, headache, nausea, dizziness, euphoria, drowsiness, fatigue, hearing loss, pneumonitis, pulmonary edema, cardiac irregularities, central nervous system depression, convulsions and loss of conciousness.
Chronic effects: Possible effects include kidney, liver and blood disorders.

EYE CONTACT

Acute: Moderate Irritation

SKIN CONTACT

Chronic: Irritation, defatting, dermatitis.

INGESTION

Acute: Causes burning sensation in mouth, throat and stomach. Possible effects include nasal and respiratory irritation, breathlessness, headache, nausea, dizziness, drowsiness, euphoria, fatigue, diarrhea, vomiting, chemical pneumonitis, pulmonary edema, cardiac irregularities, kidney failure, central nervous system depression, convulsions and loss of conciousness. Aspiration of material into the lungs can cause chemical pneumonitis which can be fatal.

POTENTIAL CARCINOGEN OR CARCINOGEN

- [ ] NOT APPLICABLE
- [X] INTER. AGENCY FOR RESEARCH ON CANCER
- [ ] NATIONAL TOXICOLOGY PROGRAM
- [ ] OSHA

The International Agency For Research on Cancer(IARC) has determined that there is evidence for the carcinogenicity of fuel oil in humans.

IARC has determined that there is sufficient evidence for the carcinogenicity in experimental animals of whole engine exhaust and extracts of diesel engine exhaust particles. IARC determined that there is only limited evidence for the carcinogenicity in humans of diesel exhaust. However, IARC's overall evaluation has resulted in the IARC designation of diesel engine exhaust as probably carcinogenic to humans (group 2A) because of the certain engine exhaust components.

VI. FIRST AID PROCEDURES

INHALATION

Move exposed person to fresh air. If breathing is difficult give oxygen. If breathing has stopped perform artificial respiration. Get medical attention as soon as possible.

EYE CONTACT

Immediately flush eyes with water for a minimum of 15 minutes, occasionally lifting the lower and upper lids. Get medical attention promptly.

SKIN CONTACT

If clothing soaked, immediately remove clothing and wash skin with soap and water. Launder clothing before reuse. If any adverse reaction occurs get medical attention promptly.

INGESTION

DO NOT INDUCE VOMITING. Immediately give 2 glasses of water. Never give anything by mouth to an unconcious person. Get medical help as soon as possible.

Note to Physicians: Activated charcoal mixture may be beneficial. Suspend 50g activated charcoal in 400mL water and mix well. Administer 5mL/kg or 350mL for an average adult.

VII. EMPLOYEE PROTECTION

RESPIRATORY PROTECTION

Respiratory protection is not required under conditions of normal use. If vapor or mist is generated when the material is heated or handled use a full-face organic vapor respirator or full-face respirator supplied with air. When fighting fires use a self-contained breathing apparatus in the positive pressure-demand mode.

PROTECTIVE CLOTHING

EYES - Chemical goggles or face shield.
SKIN - Gloves: Nitrile, neoprene or other material resistant to petroleum.

VENTILATION

Provide sufficient ventilation to keep air concentration below the specified exposure or flammable limits. Request assistance of safety and industrial hygiene personnel to determine air concentrations.

VIII. TRANSPORTATION AND STORAGE INFORMATION

DOT HAZARDOUS MATERIAL [X] YES [ ] NO	DOT HAZARD CLASS # 3 Flammable Liquid
DOT SHIPPING NAME AND #2 DIESEL FUEL NA1993 DOT LABEL(S): FLAMMABLE LIQUID	

STORAGE

Do not store near flame, heat, sparks, or strong oxidizers. Storage area should be well ventilated. Store as NFPA Class II Combustible Liquid.

IX. ENVIRONMENTAL PROTECTION INFORMATION

SPILLS

Notify emergency response personnel. Evacuate area and remove ignition sources. Build dike to contain flow. Remove free liquid, do not flush to sewer or open water. Pick up with inert absorbent and place in closed container for disposal. If flash point of residue is under 140°F utilize hazardous waste manifest and permitted hazardous waste disposal site. If flash point is above 140°F utilize permitted industrial waste disposal site.

EPA HAZARDOUS WASTE ☐ Yes ☒ No	EPA WASTE CODE None WASTE CHARACTERISTIC: None

WASTE DISPOSAL

Utilize liscensed waste disposal company. Consider incineration or recycling if feasible. Based on flash point, utilize permitted hazardous waste disposal site and manifest or permitted industrial waste disposal site. This product as produced is not specifically listed as an EPA RCRA hazardous waste according to federal regulations (40 CFR 260.271. However, when discarded or disposed of, it may meet the criteria of an "ignitable" hazardous waste. This material could become a hazardous waste if mixed or contamianted with a listed hazardous waste. It is the responsibility of the user to determine if disposal material ia hazardous according to federal, state, and local regulations.

DISCLAIMER

The information and recommendations contained in this publication have been complied from sources believed reliable and to represent the best current opinion on the subject at the time of publication. Since we cannot anticipate or control the many different conditions under which this information or our product may be used, we make no guarantee that the recommendations will be adequate for all individuals or situations. Each user of the product described herein should determine the suitability of the described product for his or her particular purpose and should comply with all federal and state rules and regulations concerning the described product.

MANAGER'S SIGNATURE	DATE

MATERIAL SAFETY DATA SHEET

FLEETLINE
SAE 5W-20 MOTOR OIL

DENNIS K. BURKE INC.
284 Eastern Ave. • PO Box 6069 • Chelsea, MA 02150
Telephone: (617) 884-7800 • Fax: (617) 884-7638

Additional copies of this MSDS can be obtained by calling 1-800-289-2875 or downloaded from our website at www.burkeoil.com

SECTION 1

PRODUCT INFORMATION

TRADE NAME (As used on label and list)
FLEETLINE
SAE 5W-20 MOTOR OIL

CHEMICAL NAME/SYNONYMS
LUBRICATING OIL

CHEMICAL FAMILY — **PETROLEUM HYDROCARBONS**
CAS NUMBER — **MIXTURE**

PRODUCT CODE
FLE 7450, FLE 7451, FLE 7452, FLE 7455

PREPARATION DATE
MAY 15, 2003

24-HOUR EMERGENCY ASSISTANCE
CHEMTREC 1-800-424-9300
In case of an accident involving hazardous materials, the Chemical Transportation Emergency Center (CHEMTREC) which is a voluntary program of the Chemical Manufacturer's Association (CMA) operates a 24-hour nationwide telephone number which can be contacted for assistance.

NATIONAL EMERGENCY RESPONSE CENTER 1-800-424-8802

MASSACHUSETTS POISON INFORMATION CENTER (617) 232-2020

GENERAL ASSISTANCE
DENNIS K. BURKE, INC. 1-800-289-2875

SECTION 2

HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

DOES PRODUCT CONTAIN HAZARDOUS INGREDIENTS? ... NO

DOES PRODUCT CONTAIN CARCINOGENS (NTP, IARC, or OSHA)? ..... NO

CHEMICAL/COMMON NAME	*CAS NUMBER*	*PERCENT*	*OSHA-PEL*	*ACGIH-TLV*
Solvent Dewaxed Light Paraffinic Distillate	64742-56-9	70-80	5 mg/m³*	5 mg/m³*
Additives	Mixture	15-20	–	–

The additive mixtures in this product have been declared a trade secret by the additive manufacturer.

* If used in applications where a mist may be generated, observe a TWA/PEL of 5 mg/m³ for mineral oil mist (OSHA and ACGIH).

This product contains the following toxic chemical category subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR 372. (percent by weight):

Zinc Compound – 1.2% or Zinc in compound form – 0.12%

SECTION 3

PHYSICAL/CHEMICAL CHARACTERISTICS

BOILING POINT ..... > 330°C (625°F)
VAPOR PRESSURE (mm Hg at 20°) . 0
VAPOR DENSITY (AIR = 1) .. not volatile
SPECIFIC GRAVITY (WATER = 1) . 0.86 to 0.87
MELTING POINT ..... < –36°C (–33°F)

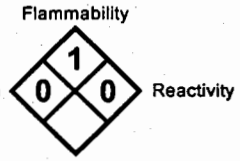
EVAPORATION RATE (n-BUTYL ACETATE = 1) 0
SOLUBILITY IN WATER .... 0 at 20°C
APPEARANCE AND ODOR – Amber liquid with a motor oil odor.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM (HMIS)

HEALTH 0
FLAMMABILITY 1
REACTIVITY 0
PROTECTION 0

NFPA FIRE HAZARD SYMBOL*

4 - Extreme
3 - High
2 - Moderate
1 - Slight
0 - Insignificant



SARA TITLE III INFORMATION

ACUTE HAZARD (Immediate Health) ..... NO
CHRONIC HAZARD (Delayed Health) ..... NO
FIRE HAZARD ..... NO
SUDDEN PRESSURE RELEASE HAZARD ..... NO
REACTIVITY HAZARD ..... NO

DOT REQUIREMENTS

DOT PROPER SHIPPING NAME
PETROLEUM LUBRICATING OIL

DOT HAZARD CLASS
NON-HAZARDOUS

DOT LABELS REQUIRED
NONE

DOT PLACARDS REQUIRED
NONE

This product has a flash point in excess of 200°F and does not require placarding.

SECTION 4

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method Used) ..... COC = 220°C (428°F)

FLAMMABLE LIMITS ..... LEL = NDA UEL = NDA

EXTINGUISHING MEDIA – Dry Chemical, Carbon Dioxide, Foam and Water Fog.

SPECIAL FIRE FIGHTING PROCEDURES – Use a smothering technique to extinguish a combustible liquid fire. Do not use a forced water stream directly on oil fires, as this will scatter the fire. Use a water fog to cool fire-exposed containers, structures, and to protect personnel.

(• continued on page 2)

SPECIAL FIRE FIGHTING PROCEDURES

(• continued from page 1)

If leak or spill has not ignited, ventilate area to protect personnel attempting to stop leak. Use water to flush spills away from sources of ignition. Do not flush down public sewers or other drainage systems.

UNUSUAL FIRE AND EXPLOSION HAZARDS – This material will not burn unless preheated. Irritating or toxic substances may be emitted upon thermal decomposition. Containers may explode in heat of fire.

SECTION 5

REACTIVITY DATA

STABILITY . . . . . STABLE

CONDITIONS TO AVOID FOR STABILITY – Avoid heat, sparks and open flames. Prevent vapor accumulation.

INCOMPATIBILITY (Materials To Avoid) – This product may react with strong oxidizing agents such as hydrogen peroxide, bromine, and chromic acid.

HAZARDOUS DECOMPOSITION – Carbon monoxide and carbon dioxide from burning. Oxides of phosphorous from burning. Oxides of sulfur.

HAZARDOUS POLYMERIZATION . . . . . NONE

SECTION 6

HEALTH HAZARD DATA

EYE CONTACT – Practically non-irritating.

SKIN CONTACT – Slightly irritating. Repeated or prolonged contact with the skin could cause redness, itching, inflammation or cracking. Symptoms may include discoloration, swelling, pain or a feeling of heat.

INJECTION – High pressure skin injections may not appear serious at first; tissue will become swollen, discolored and extremely painful.

DERMAL TOXICITY – Practically non-toxic to internal organs.

INHALATION – Low risk at ambient temperatures. Prolonged breathing of vapors can cause headache, dizziness, nausea, respiratory irritation or chemical pneumonitis.

INGESTION – Low toxicity. If less than one ounce is ingested, material may pass through the system without harm. On ingestion of large quantities, slight GI discomfort, diarrhea and headaches may occur.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE – Pre-existing dermatitis may be aggravated.

EMERGENCY AND FIRST AID PROCEDURES

EYE CONTACT – Flush immediately with fresh water. Remove contact lenses if worn. Eyelids should be held away from the eyeball to ensure thorough rinsing. Get medical attention if irritation persists.

SKIN CONTACT – Remove contaminated clothes immediately. Wash skin thoroughly with soap and water. Get medical attention if irritation persists. Wash contaminated clothes.

INJECTION – High pressure injections are serious medical emergencies. Get medical attention immediately.

INHALATION – Remove victim from source of exposure to fresh air. If breathing is difficult, provide oxygen. Get medical attention.

INGESTION – Do not induce vomiting. Unless large quantities are ingested, no treatment is necessary. However, get medical attention.

NOTES TO PHYSICIAN – In case of skin injection, prompt debridement of the wound may be necessary to minimize necrosis and tissue loss.

SECTION 7

PRECAUTIONS FOR SAFE HANDLING AND USE

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED – Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk.

To clean small spills, transfer bulk of product into another container. Absorb residue with an inert material such as earth, sand or oil absorbent. Sweep up and dispose of as solid waste in accordance with applicable federal, state and local regulations.

Considered to be a water pollutant, prevent releases of this product from contaminating soil and water, or from entering drainage and sewer systems. Contain liquid to prevent further contamination of soil, surface water or groundwater.

The Clean Water Act requires the reporting of any discharge of oil and petroleum (in any kind or form) into surface waters. Immediately call the National Emergency Response Center at 1-800-424-8802.

WASTE DISPOSAL METHODS – Place contaminated materials in containers and dispose of in accordance with applicable regulations.

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE – Store in tightly closed containers in cool, dry, isolated, well-ventilated area away from heat, sources of ignition and incompatibles.

EMPTY CONTAINERS – Empty containers may contain flammable/combustible residue or vapors. Do not cut, drill, weld, reuse or dispose of containers unless precautions are taken against these hazards.

SECTION 8

CONTROL MEASURES

RESPIRATORY PROTECTION – NIOSH/MSHA approved self-contained breathing apparatus or supplied-air mask must be available for non-routine and emergency use. Ventilation may be used to control or reduce airborne concentrations.

VENTILATION

LOCAL EXHAUST . . . . . NA

MECHANICAL (General) . . . . . NA

SPECIAL . . . . . NA

OTHER . . . . . NA

SKIN PROTECTION – Wear neoprene gloves and protective clothing to prevent skin contact.

EYE PROTECTION – Wear safety glasses to prevent eye contact. Have eye washing facility readily available where eye contact can occur.

WORK PRACTICES – Do not use or store near flame, sparks or hot surfaces. Use only in well ventilated area. Keep container closed. Do not weld, heat or drill container. Replace cap or bung. Do not use pressure to empty drum or explosion may result. Keep head away from container when opening or dispensing.

HYGIENIC PRACTICES – Launder soiled clothing. Wash thoroughly with soap and water after handling.

NA = NOT APPLICABLE NDA = NO DATA AVAILABLE

THE SOMERSET REFINERY, INC

600 MONTICELLO ST.
P.O. BOX 1547
SOMERSET, KY 42502

Update 10 Mar 2000
Bruce C. McGowan
NoO2gas

MATERIAL SAFETY DATA SHEET

EMERGENCY NUMBERS: ATSDR (24hr) (404) 639-0615 Somerset Refiner (606) 678-8194

I. PRODUCT IDENTIFICATION

PRODUCT: **Unleaded Gasoline , All Gra** CHEMICAL NAME: Gasoline, Petrol

This MSDS applies to all grades of unoxygenated (no ethanol added) gasoline supplied by Somerset Oil.

a.) 87 Octane Unleaded Gasoilne
b.). 89 Octane Unleaded Gasoline
c.) 91 Octane Unleaded Gasoline

CHEMICAL FAMILY: Petroleum Hydrocarbon	FORMULA: C3 - C	CAS #: 86290-81-5
NATIONAL FIRE PROTECTION ASSOCIATION RATING CODE:	HEALTH CODE:	1
	FIRE CODE:	3
LEAST (0), SLIGHT (1), MODERATE (2), HIGH (3), EXTREME (4	REACTIVITY COI	0

II. HAZARDOUS COMPONENTS

INGREDIENT	%	OSHA LIMIT	TLV
Gasoline (CAS # 86290-81-5)	100	TWA - 500 ppm	TWA - 300 ppm STEL - 500 ppm
Benzene (CAS # 71-43-2)	0.1 - 5	TWA - 0.5 ppm Ceiling - 1 ppm	TWA - 0.1 ppm STEL - 5 ppm
Cumene (CAS # 98-82-8)	0 - 2	TWA - 50 ppm	TWA - 50 ppm
Ethylbenzene (CAS # 100-41-4)	1 - 2	TWA -100 ppm	TWA - 100 ppm
Pseudocumene (CAS # 95-63-6)	0 - 3	TWA - 25 ppm	STEL - 125 ppm TWA - 25 ppm
Toluene (CAS # 108-88-3)	5 - 15	TWA - 200 ppm Ceiling - 300 ppm	TWA - 50 ppm STEL - 150 ppm
Xylene (CAS # 1330-20-7)	4 - 10	TWA - 100 ppm	TWA - 100 ppm STEL - 150ppm

III. PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT	VAPOR PRESSURE	EVAPORATION (Ethyl Ether = 1)
78 - 90 °F	325 - 525 mmHg @ 68°F	Estimated 1.5 Times Slower
VOLATILE BY VOLUME %	AVERAGE MOLAR MASS	APPEARANCE
100	Approximately 100	Red Liquid
ODOR AND THRESHOLD	MELTING POINT	DENSITY OF VAPOR (Air = 1)
Gasoline 10ppm	Not Applicable	3 - 4
SPECIFIC GRAVITY (Water = 1)	VISCOSITY	SOLUBILITY (g/100g Water @ 20°C)
0.70 - 0.73	Not Applicable	Negligible

IV. FIRE PROTECTION INFORMATION

FLASH POINT / METHOD	AUTOIGNITION TEMPERAT	FLAMMABLE LIMITS (% Volume in Air
-45°F / Tag Closed Cup	536°F or Higher	LOWER 1.4 UPPER 7.6

EXTINGUISHING MEDIA AND FIREFIGHTING PROCEDURES

Carbon dioxide, dry chemical, or foam. Water stream may spread fire, use water spray only to cool containers exposed to fire. If leak or spill has not ignited, use water spray to disperse the vapors and flush spills away from sources of potential ignition. Do not enter enclosed or confined spaces without proper protective equipment including a full face self-contained breathing apparatus in the positive pressure demand mode when fighting fires.

HAZARDOUS DECOMPOSITION PRODUCTS

Products of combustion may contain carbon monoxide, carbon dioxide and other toxic materials.

FIRE AND EXPLOSION HAZARDS

Avoid undue exposure to air. Avoid heat, sparks and flame. Can form flammable mixtures with air and flash at room temperature. Explosion hazard in fire situation. Vapor heavier than air and may travel considerable distance to a source of ignition and flash back.

INCOMPATABILITY WITH OTHER MATERIALS

Incompatible or can react with strong oxidizers.

HAZARDOUS POLYMERIZATION	CHEMICAL STABILITY
[X] WILL NOT OCCUR [ ] WILL OCCUR	[X] STABLE [ ] UNSTABLE

V. HEALTH EFFECTS

INHALATION

Medical conditions aggravated by exposure: kidney, liver or blood disorders.
Acute effects: Possible effects include headache, nasal and respiratory irritation, nausea, dizziness, euphoria, breathlessness, drowsiness, fatigue, hearing loss, pnemonitis, pulmonary edema, cadiac irregularities, central nervous system depression, convulsions and loss of conciousness.
Chronic effects: Possible effects include kidney, liver and blood disorders, including anemia and leukemia. Laboratory animals exposed for a long duration have been shown to develop kidney and liver tumors.

EYE CONTACT

Acute: Irritation

SKIN CONTACT

Acute: Possible narcosis.
Chronic: Irritation, dermatitis.

INGESTION

Acute: Possible effects include headache, nasal and respiratory irritation nausea, dizziness, drowsiness, euphoria, breathlessness, fatigue, pneumonitis, pulmonary edema, cardiac irregularities central nervous system depression, convulsions and loss of conciousness. Aspiration hazard if ingested.

REPORTED AS POTENTIAL CARCINOGEN OR CARCINOGEN

Contains: Benzene, Cumene, Toluene and Xylene.

- [ ] NOT APPLICABLE
- [X] INTER. AGENCY FOR RESEARCH ON CANCER
- [X] NATIONAL TOXICOLOGY PROGRAM
- [X] OSHA

OSHA REQUIRED LABEL: DANGER, CONTAINS BENZENE, CANCER HAZARD

VI. FIRST AID PROCEDURES

INHALATION

Move exposed person to fresh air. If breathing has stopped, perform artificial respiration. If breathing is difficult give oxygen. Get medical attention as soon as possible.

EYE CONTACT

Immediately flush eyes with water for a minimum of 15 minutes, occasionally lifting the lower and upper lids.
Get medical attention promptly.

SKIN CONTACT

If clothing soaked, immediately remove clothing and wash skin with soap and water. Launder clothing before wearing. If any adverse reaction occurs get medical attention promptly.

INGESTION

DO NOT INDUCE VOMITING. Immediately give 2 glasses of water. Never give anything by mouth to an unconcious person. Get medical help as soon as possible.

Note to Physicians: Activated charcoal mixture may be beneficial. Suspend 50g activated charcoal in 400mL water and mix well. Administer 5mL/kg or 350mL for an average adult.

VII. EMPLOYEE PROTECTION

RESPIRATORY PROTECTION

Up to 10ppm benzene/1000ppm gasoline - Half-mask organic respirator.
Up to 50ppm benzene/5000ppm gasoline - Full-face organic vapor respirator or full-face respirator supplied with air.
Greater than 50ppm benzene/5000ppm gasoline, fire fighting or unknown concentration - Self-contained breathing apparatus with positive pressure.

PROTECTIVE CLOTHING

EYES - Chemical goggles or face shield.
SKIN - Gloves: Nitrile, neoprene or other material resistant to gasoline.

VENTILATION

Use in well ventilated area order to keep air concentration below 300ppm gasoline and 0.10ppm benzene. Request assistance of safety and industrial hygiene personnel to determine air concentrations.

VIII. TRANSPORTATION AND STORAGE INFORMATION

DOT HAZARDOUS MATERIAL [X] YES [ ] NO	DOT HAZARD CLASS # 3 Flammable Liquid

DOT SHIPPING NAME AND GASOLINE UN1203
DOT LABEL(S): FLAMMABLE LIQUID

STORAGE

Do not store near flame, heat, sparks, or strong oxidizers.
Storage area should be well ventilated.
Store as OSHA Class IB Flammable Liquid.

IX. ENVIRONMENTAL PROTECTION INFORMATION

SPILLS

Notify emergency response personnel. Evacuate area and remove ignition sources. Build dike to contain flow. Remove free liquid, do not flush to sewer or open water. Pick up with inert absorbent and place in closed container for disposal. If flash point of residue is under 140°F utilize hazardous waste manifest and permitted hazardous waste disposal site. If flash point is above 140°F utilize permitted industrial waste disposal site.

EPA HAZARDOUS WASTE [X] Yes [ ] No	EPA WASTE CODE NO.: D 001 and D 018 WASTE CHARACTERISTIC: Ignitable

WASTE DISPOSAL

Utilize liscensed waste disposal company. Consider incineration or recycling if feasible. Based on flash point, utilize permitted hazardous waste disposal site and manifest or permitted industrial waste disposal site.

DISCLAIMER

The information and recommendations contained in this publication have been complied from sources believed reliable and to represent the best current opinion on the subject at the time of publication. Since we cannot anticipate or control the many different conditions under which this information or our product may be used, we make no guarantee that the recommendations will be adequate for all individuals or situations. Each user of the product described herein should determine the suitability of the described product for his or her particular purpose and should comply with all federal and state rules and regulations concerning the described product.

MANAGER'S SIGNATURE	DATE

OWEN COMPLIANCE SERVICES, INC.

Material Safety Data Sheet
(MSDS-SC)

PRODUCT IDENTIFICATION	
Product Name	Shaped Charges
Trade Names and Synonyms	Casing cutters, Junk Shots, Linear Shaped Charges (LSC), Perforators, Severing Tools, Tubing Cutters, Split Shot® Cutters
Manufacturer/Distributor	Various manufacturers including Owen Oil Tools, Inc., GOEX International, Inc., Halliburton Energy Services (Jet Research Center), Shaped Charged Specialists, Harrison Jet Guns, Atlas Wireline, Schlumberger Perforating Center, High Energy International
Transportation Emergency	**800-255-3924 (24 hrs -- *CHEM • TEL*)**

PREVENTION OF ACCIDENTS IN THE USE OF EXPLOSIVES

The prevention of accidents in the use of explosives is a result of careful planning and observance of the best known practices. The explosives user must remember that he is dealing with a powerful force and that various devices and methods have been developed to assist him in directing this force. He should realize that this force, if misdirected, may either kill or injure both him and his fellow workers.

WARNING

All explosives are dangerous and must be carefully handled and used following approved safety procedures either by or under the direction of competent, experienced persons in accordance with all applicable federal, state, and local laws, regulations, or ordinances. If you have any questions or doubts as to how to use any explosive product, **DO NOT USE IT** before consulting with your supervisor, or the manufacturer, if you do not have a supervisor. If your supervisor has any questions or doubts, he should consult the manufacturer before use.

HAZARDOUS COMPONENTS			
Material or Component	**CAS No.**	**TLV**	**PEL**
RDX (Cyclotrimethylenetrinitramine)	00121-82-4	1.5 mg/m^3	1.5 mg/m^3
HMX (Cyclotetramethylenetetranitramine)	026914-41-0	NE	NE
HNS (Hexanitrostilbene)	20062-22-0	NE	NE
PYX (Picrylaminodinitropyridine)	38082-89-2	NE	NE
Desensitizing Wax	N/A	NE	NE
Aluminum	07429-90-5	5 mg/m^3	10 mg/m^3
Corrosion resistant steel	N/A	NE	NE
Iron	07439-89-6	5 mg/m^3	10 mg/m^3
Graphite	07782-42-5	15mppcf (TWA)	2.5 mg/m3
Copper	07440-50-8	1 mg/m^3	1 mg/m^3
Lead	07439-92-1	0.15 mg/m^3	50 $\mu g/m^3$
Tungsten	07440-33-7	5 mg/m^3	5 mg/m^3
Zinc	07440-66-6	NE	NE
N/A = Not assigned NE = Not established			

PHYSICAL DATA
Explosives shaped charges contained in metal, glass, or ceramic cases.

HAZARDOUS REACTIVITY	
Instability	Detonates with friction, impact, heat, low level electrical current, electrostatic or RF energy.
Incompatibility	Acids and alkalis
Hazardous decomposition	Detonation produces hazardous fragments. Gases produced may contain carbon monoxide and nitrogen oxides.
Polymerization	Polymerization will not occur.

FIRE AND EXPLOSION DATA	
Flashpoint	Not applicable
Extinguishing media	None
Special fire fighting procedures	**ALL EXPLOSIVES: DO NOT FIGHT EXPLOSIVES FIRES.** Try to keep fire from reaching explosives. Isolate area. Guard against intruders. Division 1.1 Explosives: Evacuate the area for 5000 feet (1 mile). Consult *the 2000 Emergency Response Guidebook, Guide 112* for further details. Division 1.4 Explosives: Evacuate the area for 1500 feet (1/3 mile). Consult *the 2000 Emergency Response Guidebook, Guide 114* for further details.
Unusual fire and explosion hazards	May detonate with impact or on heating.

HEALTH HAZARDS	
General	Shaped Charges do not present health hazards in normal handling and use; however, the products are Division 1.1 or 1.4 explosives, and detonation may cause severe physical injury, including death. All explosives are dangerous and must be handled carefully and used following approved safety procedures under the direction of competent, experienced persons in accordance with all applicable federal, state, and local laws, regulations, and ordinances. Inhalation of explosives powders may cause nervous system irregularities including headaches and dizziness. Nitrogen oxides generated during use are skin, eye, and respiratory tract irritants.
Carcinogenicity	None of the components of shaped charges are listed as a carcinogen by NTP, IARC, or OSHA.

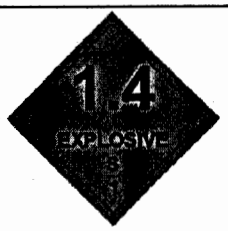
FIRST AID	
Inhalation	Not a likely route of exposure. If inhaled, remove to fresh air. If not breathing, give artificial respiration, preferably by mouth-to-mouth. If breathing is difficult, give oxygen. Seek prompt medical attention.
Eye and skin contact	Not a likely route of exposure.
Ingestion	Not a likely route of exposure.
Injury from detonation	Seek prompt medical attention.

SPILL OR LEAK PROCEDURES	
Spill/leak response	Use appropriate personal protective equipment. Isolate area and remove sources of friction, impact, heat, low level electrical current, electrostatic or RF energy. Only competent, experienced persons should be involved in cleanup procedures. Sweep up with non-sparking tools and remove.
Waste disposal	Dispose of in compliance with federal regulations under the authority of the *Resource Conservation and Recovery Act* (40 CFR Parts 260-271).

SPECIAL PROTECTION INFORMATION	
Ventilation	Use only with adequate ventilation.
Respiratory	NIOSH approved particle masks for dust and mist.
Eye	Safety glasses or goggles.
Gloves	Impervious rubber gloves.
Other	Cotton overalls, undergarments, and socks. Conductive soled shoes.

SPECIAL PRECAUTIONS
Keep away from friction, impact, and heat. Do not consume food, drink, or tobacco in areas where they may become contaminated with these materials.

STORAGE CONDITIONS
Store in accordance with the requirements of *Subpart K, ATF: Explosives Law and Regulations* (27 CFR 55.201-55.219).

SHIPPING INFORMATION		
Proper shipping name	Charges, shaped, flexible, linear	
Hazard class	1.1D	
UN Number	UN0288	
Proper shipping name	Charges, shaped	
Hazard class	1.1D, 1.4D, or 1.4S	
UN Number	1.1D	UN0059
	1.4D	UN0440
	1.4S	UN0441
Proper shipping name	Articles, explosives, n.o.s. (Casing cutter without Detonator Unassembled)	
Hazard class	1.4S, 1.4D, 1.1D	
UN Number	1.4S	UN0349
	1.4D	UN0352
	1.1D	UN0463
DOT Label & Placard	DOT Label	 1.1D Products  1.4D Products  1.4S Products
	DOT Placard	 1.1D Products    1.4D Products 1.4S Products ◂ **OR** ▸ 1.4D/1.4S Products

The information contained in this Material Safety Data Sheet is based upon available data and believed to be correct; however, as such has been obtained from various sources, including the manufacturer and independent laboratories, it is given without warranty or representation that it is complete, accurate, and can be relied upon. *OWEN COMPLIANCE SERVICES, INC.* has not attempted to conceal in any manner the deleterious aspects of the product listed herein, but makes no warranty as to such. Further, *OWEN COMPLIANCE SERVICES, INC.* cannot anticipate nor control the many situations in which the product or this information may be used; there is no guarantee that the health and safety precautions suggested will be proper under all conditions. It is the sole responsibility of each user of the product to determine and comply with the requirements of all applicable laws and regulations regarding its use. This information is given solely for the purposes of safety to persons and property. Any other use of this information is expressly prohibited.

For further information contact: David W. Boston, President
OWEN COMPLIANCE SERVICES, INC.
12001 County Road 1000
P.O. Box 765
Godley, TX 76044
Telephone number: 817-551-0660
FAX number: 817-396-4584

MSDS prepared by: David W. Boston
Original publication date: 09/13/93
Revision date: 12/03/03

KINEPAK Liquid

Material Safety Data Sheet

5700 N. Portland, Suite 301 / Oklahoma City, OK 73112 / Phone: (405) 947-0765 / Fax: (405) 947-0768

SECTION 1 - PRODUCT INFORMATION

TRADE NAME:	KINEPAK Liquid
SYNONYM:	K1/3S, K1/2WP, K1S, K1BB, K1/2FS, K1P,
CHEMICAL FAMILY:	Nitromethane
FORMULA:	CH3 N02
CAS NUMBER:	None
UN/NA NUMBER:	UN 1261
DOT HAZARD CLASS:	3

SECTION 2 - HEALTH ALERT

DANGER - If misused or disposed of improperly, material could explode and cause death or serious injury.
DO NOT HANDLE WHEN IN DOUBT!!
See section VIII - Personal Protection
CHEM-TEL, INC. (800) 255-3924.

SECTION 3 - HEALTH HAZARD INFORMATION

EYE: May cause moderate irritation.
SKIN: May cause moderate irritation characterized my redness and pain.
INHALATION: Inhalation of decomposed products may irritate the respiratory tract. Prolonged exposure to these fumes may result in respiratory difficulties (shortness of breath, etc.) and possibly more severe toxic effects.
INGESTION: Swallowing large quantities may cause toxicity characterized by dizziness, bluish skin coloration, methemoglobinemia, unconsciousness, abdominal spasms, nausea, and pain.

SECTION 4 - EMERGENCY AND FIRST AID PROCEDURES

EYE CONTACT: Flush with large amounts of water. Seek medical aid.
SKIN CONTACT: Remove contaminated clothing. Wash skin thoroughly with soap and water.
INHALATION: Remove from exposure. If breathing stops or is difficult, administer artificial respiration or oxygen. Seek medical aid.
INGESTION: Give 1-2 large glasses of milk or water. Induce vomiting. Seek medical aid .

SECTION 5 - RECOMMENDED OCCUPATIONAL EXPOSURE LIMIT/ HAZARDOUS INGREDIENTS

EXPOSURE LIMIT (PRODUCT): None required for product.

HAZARDOUS INGREDIENTS:	PERCENT	EXPOSURE LIMIT	PPM	MG/M3
Nitromethane(ACG/H CAS No. 75-52-5)	Min.95-100%	ACG/H TWA		250

SECTION 6 - REACTIVITY DATA

CONDITIONS CONTRIBUTING TO INSTABILITY: Heat (confinement); Stacking (burning), sparks.
INCOMPATIBILITY: Can react violently or explode, with reducing agents and organic materials. Avoid amines, strong alkalies & acids. ***HAZARDOUS REACTION / DECOMPOSITION PRODUCTS:*** At high temperatures, especially >374 F, may emit severe toxic fumes of nitrogen oxides.
CONDITIONS CONTRIBUTING TO HAZARDOUS POLYMERIZATION: Not applicable.

SECTION 7 - FIRE AND EXPLOSION HAZARD INFORMATION

FLASH POINT & METHOD: 95°F, ***AUTO IGNITION TEMPERATURE:*** 784° F,
FLAMMABLE LIMITS (% BY VOLUME/AIR): LOWER: 7.3 at 33 °C
EXTINGUISHING MEDIA: Water, Foam, CO2
FIRE-FIGHTING PROCEDURES: When explosive is burning, EVACUATE AREA. Avoid breathing vapor.
FIRE & EXPLOSION HAZARDS: Dangerous when exposed to heat or flame. Can support combustion of other materials involved in a fire and is capable of undergoing detonation if heated to high temperatures, especially under confinement including being piled on itself in a burning fire. When heated to decomposition, highly toxic fumes may be emitted. Do not return to area of explosion until smoke and fumes have dissipated. Dry alkali or amine salts are explosive.

KINEPAK Liquid

Material Safety Data Sheet

SECTION 8 - PERSONAL PROTECTION INFORMATION

EYE PROTECTION: Safety glasses approved for preventing eye contact.
SKIN PROTECTION: Neoprene, natural rubber, polyethylene or polyvinyl chloride gloves. Use barrier creams, hand protection and protective clothing.
RESPIRATORY PROTECTION: Not normally required. Mechanical filter or supplied air type respirator as required for concentrations exceeding the occupational exposure limit.
VENTILATION: Maintain adequate ventilation. Use local exhaust if needed.

SECTION 9 - PERSONAL HANDLING INSTRUCTIONS

HANDLING: Explosives should not be abandoned at any location for any reason. Do not handle during electrical storms.
STORAGE: Store in a cool, dry, well-ventilated area remote from operations. Storage area should be of non-combustible construction. Organic materials, flammable substances and finely divided metals should be stored separately. Flames, smoking and unauthorized personnel are prohibited where this product is used or stored. Protect against physical damage, static electricity and lighting.
WARNING: Use of this product by persons lacking adequate training, experience and supervision may result in death or serious injury. Obey all Federal, State, and local laws / regulations applicable to transportation, storage, handling, and use of flammable liquids and explosives.
DISTANCE: Always stay away from area of explosion or disposal sites. Stay behind suitable barriers.

SECTION 10 - SPILL & LEAK PROCEDURES

PROCEDURES IF MATERIAL IS RELEASED OR SPILLED (IN ADDITION, SEE SECTION 8): Isolate area. Eliminate ALL sources of ignition. Avoid skin contact. Scrape up. Remove soiled clothing.
WASTE DISPOSAL - USE APPROPRIATE METHOD(S): Disposal of unexploded or deteriorated explosives material can be hazardous. Expert assistance is positively recommended in destroying explosives. Accidents can be prevented by thorough planning and handling in accordance with approved methods. Consult your supervisor, or the nearest SEC Regional Office for assistance. If improperly disposed of, material could explode and cause death or serious injury.
In all cases, follow facility emergency response procedures. Contact Facility Environmental Manager for assistance. Report any discharge of oil or hazardous substance that may enter surface waters to the National Response Center (800) 424 - 8802.

Observe all applicable local, state, and federal environmental spill and water quality regulations.

SECTION 11 - PHYSICAL DATA

BOILING POINT: 101°C (Nitromethane) ***MELTING POINT: -28.6 C%*** (Nitromethane)
VAPOR PRESSURE: 27.3 mm (mm Hg at 20 deg. C)
EVAPORATION RATE:(BUTYL ACETATE=100):1.39 ***VAPOR DENSITY (AIR=1):*** 2.1
VISCOSITY: NA ***SOLUBILITY IN WATER:*** Completely Soluble ***APPEARANCE/ ODOR:*** Colorless liquid

SECTION 12 - COMMENTS

This product is classified as a flammable liquid, ltd. Quantities and need not be stored in a high explosive magazine, except where required by local regulations. Storage should be in a well constructed, well ventilated, dry structure located to conform with local, state, and federal regulations.

Normal operating conditions are assumed unless otherwise stated. If any given information is not clear or does not apply to your situation, STOP, store the material suitably, and seek correct help from your supervisors, Institute of Makers of Explosives or **Slurry Explosive Corporation**. Disposal sites must be clear of people at the time of disposal.

NOTICE: The data and recommendations presented herein are based upon data which are considered to be accurate. However, Slurry makes no guarantee or warranty, either expressed or implied, of the accuracy or completeness of these data and recommendations.

KINEPAK SOLID

Material Safety Data Sheet

5700 N. Portland, Suite 301 / Oklahoma City, OK 73112 / Phone: (405) 947-0765 / Fax: (405) 947-0768

SECTION 1 - PRODUCT INFORMATION

TRADE NAME:	KINEPAK Solid
SYNONYM:	K1/3S,K1/2WP, K1S K1BB, K1/2FS, K1P,K2P,K4P
CHEMICAL FAMILY:	Nitrate
FORMULA:	NH4,NO3
CAS NUMBER:	6484-52-2
UN/NA NUMBER:	UN1942
DOT HAZARD CLASS:	5.1

SECTION 2 - HEALTH ALERT

DANGER - If misused or disposed of improperly, material could explode and cause death or serious injury.
DO NOT HANDLE WHEN IN DOUBT!!
See section VIII - Personal Protection
CHEM-TEL, INC. (800) 255-3924.

SECTION 3 - HEALTH HAZARD INFORMATION

EYE: Moderate irritant causing moderate initial pain.
SKIN: May cause moderate irritation characterized my redness and pain.
INHALATION: Inhalation of decomposed products may irritate the respiratory tract. Prolonged exposure to these fumes may result in respiratory difficulties (shortness of breath, etc.) and possibly more severe toxic effects.
INGESTION: Swallowing may cause toxicity characterized by dizziness, bluish skin coloration, methemoglobinemia, unconsciousness, abdominal spasms, nausea, and pain.

SECTION 4 - EMERGENCY AND FIRST AID PROCEDURES

EYE CONTACT:Flush with large amounts of water. Seek medical aid. ***SKIN CONTACT:*** Remove contaminated clothing. Wash skin thoroughly with soap and water. Seek Medical Aid Immediately. ***INHALATION:*** Remove from exposure. If breathing stops or is difficult, administer artificial respiration or oxygen. Seek medical aid.
INGESTION: Give 1 cup of water to dilute material. Do not induce vomiting. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. Seek medical aid IMMEDIATELY.

SECTION 5 - RECOMMENDED OCCUPATIONAL EXPOSURE LIMIT/ HAZARDOUS INGREDIENTS
EXPOSURE LIMIT (PRODUCT): None required for product.

HAZARDOUS INGREDIENTS:	PERCENT	EXPOSURE LIMIT	PPM	MG/M3
Ammonium Nitrate	99-100%	NONE		

SECTION 6 - REACTIVITY DATA

CONDITIONS CONTRIBUTING TO INSTABILITY: Heat (confinement); Stacking (burning). ***INCOMPATIBILITY:*** Avoid oxidizable materials, metal powder, copper, bronze, fuels (e.g. lubricants, machine oils),Fluorocarbon lubricants, acids, corrosive liquids, chlorates, sulphur, charcoal, coke and other finely divided combustibles.
HAZARDOUS REACTION / DECOMPOSITION PRODUCTS: Toxic gases and vapors (oxides of nitrogen) will be released by thermal decomposition (about 210° C). At higher temperatures, decomposition may be explosive, especially if confined. ***CONDITIONS CONTRIBUTING TO HAZARDOUS POLYMERIZATION:*** Not applicable.

SECTION 7 - FIRE AND EXPLOSION HAZARD INFORMATION

FLASH POINT & METHOD: NA ***AUTO IGNITION TEMPERATURE:*** Explodes
FLAMMABLE LIMITS (% BY VOLUME/AIR): LOWER: NA UPPER: NA ***EXTINGUISHING MEDIA:*** Water only
FIRE-FIGHTING PROCEDURES: Large quantities of water should be used to cool containers, cool and dilute the burning material. A water spray can also be used to knock down fumes ***FIRE & EXPLOSION HAZARDS:*** Attempts to smother a fire involving this product will be ineffective as it is its own oxygen source. Smothering could lead to decomposition and explosions. This product is more sensitive if contaminated with organics, or oxidizable materials or if heated while confined. Unless the mass of product on fire is flooded with water, re-ignition is possible.

KINEPAK SOLID

Material Safety Data Sheet

SECTION 8 - PERSONAL PROTECTION INFORMATION

EYE PROTECTION: Safety glasses approved for preventing eye contact.
SKIN PROTECTION: Neoprene, natural rubber, polyethylene or polyvinyl chloride gloves. Use barrier creams, hand protection and protective clothing.
RESPIRATORY PROTECTION: A NIOSH/MSHA- approved dust respirator, if concentrations in air are unknown or in excess of established exposure guidelines.
VENTILATION: Maintain adequate ventilation. Use of local exhaust required.

SECTION 9 - PERSONAL HANDLING INSTRUCTIONS

HANDLING: Explosives should not be abandoned at any location for any reason. Do not handle during electrical storms. ***STORAGE:*** Store in a cool, dry, well-ventilated area remote from operations. Storage area should be of non-combustible construction. Organic materials, flammable substances and finely divided metals should be stored separately. Flames, smoking and unauthorized personnel are prohibited where this product is used or stored. Protect against physical damage, static electricity and lightning.
WARNING: Use of this product by persons lacking adequate training, experience and supervision may result in death or serious injury. Obey all Federal, State, and local laws / regulations applicable to transportation, storage, handling, and use of explosives. ***DISTANCE:*** Always stay from area of explosion or disposal sites. Stay behind suitable barriers.

SECTION 10 - SPILL & LEAK PROCEDURES

PROCEDURES IF MATERIAL IS RELEASED OR SPILLED (IN ADDITION, SEE SECTION 8): Isolate area. Eliminate ALL sources of ignition. Avoid skin contact. Sweep up. Remove soiled clothing. Do not allow to enter sewers or watercourses.
WASTE DISPOSAL - USE APPROPRIATE METHOD(S): Disposal of unexploded or deteriorated explosives material can be hazardous. Expert assistance is positively recommended in destroying explosives. Accidents can be prevented by thorough planning and handling in accordance with approved methods. Consult your supervisor, or the nearest SEC Regional Office for assistance. If improperly disposed of, material could explode and cause death or serious injury.

In all cases, follow facility emergency response procedures. Contact Facility Environmental Manager for assistance. Report any discharge of oil or hazardous substance that may enter surface waters to the National Response Center (800) 424 - 8802.

Observe all applicable local, state, and federal environmental spill and water quality regulations.

SECTION 11 - PHYSICAL DATA

BOILING POINT: 210°C (410°) ***BULK DENSITY:*** 46-50lb/ft3: 0.77-0.82 g/cm3 ***VOLATILE BY VOLUME:*** NA
MELTING POINT: 160 to 165°C (320 to 329°F) ***VAPOR PRESSURE:***(mm hg at 20°C):0 ***VISCOSITY:*** NA
EVAPORATION RATE (ETHER=1): NA ***VAPOR DENSITY (AIR=1):*** NA ***SOLUBILITY IN WATER:*** 79% at 25°C (77°F) ***APPEARANCE/ ODOR:*** Free-flowing, hygroscopic, grey-white colored prills, Odorless.

SECTION 12 - COMMENTS

Storage should be in a well constructed, well ventilated, dry structure located to conform with local, state, and federal regulations.

Normal operating conditions are assumed unless otherwise stated. If any given information is not clear or does not apply to your situation, STOP, store the material suitably, and seek correct help from your supervisors, Institute of Makers of Explosives or Slurry Explosive Corporation. Disposal sites must be clear of people at the time of disposal.

NOTICE: The data and recommendations presented herein are based upon data which are considered to be accurate. However, Slurry makes no guarantee or warranty, either expressed or implied, of the accuracy or completeness of these data and recommendations.

DYNO
Dyno Nobel

MATERIAL SAFETY DATA SHEET
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FOR 24 HOUR EMERGENCY CALL
CHEMTREC 800-424-9300 CANUTEC 613-996-6666

MSDS# 1121

DATE: 7/07/04

Supersedes MSDS
1121 08/01/03
EBCo ENSI122

SECTION I - PRODUCT IDENTIFICATION

Trade Name(s):

40 RDX NYLON LS
40 RDX NYLON RIBBON LS
80 RDX NYLON
80 RDX NYLON LS
80 RDX NYLON XHV LS
80 PETN Plastic
100 PETN Plastic
80 PYX LS
40 HMX NYLON LS
40 HMX NYLON RIBBON LS
50 HMX LOPRO NYLON LS
60 HMX NYLON LS
60 HMX HI-TEMP LOW PROFILE LS
60 HMX HI-TEMP LS
80 HMX NYLON LS
80 HMX HI-TEMP LS
80 HMX NYLON XHV LS

Product Class: Detonating Cord, Specialty (Oil Field)

Product Appearance & Odor: Flexible white or colored cord of woven textile with a protected explosive core of RDX (dyed pink), PETN, HMX (white crystalline powders) or PYX (yellow) and covered by a white or colored nylon, fluoro-copolymer or polyethylene plastic or textile jacket. No odor.

DOT Hazard Shipping Description: Cord, detonating 1.1D UN0065 II -or-
Cord, detonating 1.4D UN0289 II -or- Articles, explosive, n.o.s. (*explosive name*) 1.4S UN0349 II
where the *explosive name* would be either RDX, HMX or PYX (spelled out)

NFPA Hazard Classification: Not Applicable (See Section IV - Special Fire Fighting Procedures)

SECTION II - HAZARDOUS INGREDIENTS

		EXPOSURE LIMITS	
Ingredients	**CAS#**	**OSHA PEL**	**TLV-ACGIH[2]**
Pentaerythritol tetranitrate (PETN)	78-11-5	None[1]	None[2]
Cyclotrimethylene trinitramine (RDX)	121-82-4	None[1]	0.5 mg/m^3 (skin)
Cyclotetramethylene tetranitramine (HMX)	2691-41-0	None[1]	None[2]
2,6-Bis(picrylamino)-3,5-dinitropyridine (PYX)	38082-89-2	None[1]	None[2]
Ammonium Hydroxide	1336-21-6	None[1]	None[2]
Tributyl phosphate	126-73-8	5 mg/m^3	0.2 mg/m^3

[1] Use limit for particulates not otherwise regulated (PNOR): Total dust, 15 mg/m^3 ; respirable fraction, 5 mg/m^3 .
[2] Use limit for particulates not otherwise classified (PNOC): Inhalable particulate, 10 mg/m^3 ; respirable particulate, 3 mg/m^3 .

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

* Core powder is predominantly one of the four explosive powders (PETN, RDX, HMX or PYX) with the possible trace amount of the other listed hazardous material. The approximate amount of explosive in a given grade of cord is expressed as that number of grains of explosive per linear foot of cord.
Example: 80 RDX NYLON contains about 80 grains RDX per foot of cord. (1 gram/meter = 4.7 grains/foot)

SECTION III - PHYSICAL DATA

Boiling Point: Not Applicable **Percent Volatile by Volume:** Not Applicable

Melting Point: PETN decomposes at melting point, about 141°C RDX decomposes at 190 – 200°C
HMX decomposes violently at melting point, about 278°C PYX melts at 370°C

Vapor Pressure: Not Applicable **Vapor Density:** (Air = 1) Not Applicable **Solubility In Water:** Insoluble.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: Not Applicable **Flammable Limits:** Not Applicable

Extinguishing Media: (See Special Fire Fighting Procedures section.)

Special Fire Fighting Procedures: Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe, distant location. Allow fire to burn unless it can be fought remotely or with fixed extinguishing systems (sprinklers). For transportation fires involving large quantities of detonating cord, such as a trailer load, evacuate no less than 2,500 feet in all directions.

Unusual Fire and Explosion Hazards: Can explode or detonate under fire conditions. Burning or detonating material may produce toxic vapors.

SECTION V - HEALTH HAZARD DATA

Effects of Overexposure
This is a packaged product that will not result in exposure to the explosive core material under normal conditions of use.

Eyes: May cause irritation, redness and tearing. PYX is a known eye irritant.

Skin: May cause irritation.

Ingestion: PETN is moderately toxic if ingested. See systemic effects below. HMX and RDX are poisonous by ingestion. See systemic effects below.

Inhalation: See systemic effects below.

Systemic or Other Effects: PETN is a known coronary vasodilator, and ingestion or inhalation may result in a lowering of blood pressure, headache or faintness, and a decreased tolerance for grain alcohol. Repeated over-exposure may result in chest pains in the absence of exposure. Systemic effects by ingestion include dermatitis.
Nitramines (RDX, HMX) are known sensitizers, meaning some people tend to become highly allergic over time to these materials, particularly if ingested or inhaled. Breathing RDX dust can cause spasms, nasal and respiratory irritation and cardiovascular collapse, and may affect the central nervous system and liver.
Carcinogenicity: No constituents are listed by NTP, IARC or OSHA.

Emergency and First Aid Procedures

Eye: Irrigate with running water for at least fifteen minutes. If irritation persists, seek medical attention.

Skin: Wash thoroughly with soap and water. If skin irritation occurs, seek medical attention.

Ingestion: Seek medical attention. Treat ingestion of RDX with gastric wash.

Inhalation: Remove to fresh air. If symptoms persist, seek medical attention.

Special Considerations: None.

SECTION VI - REACTIVITY DATA

Stability: Stable under normal conditions, may explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

Conditions to Avoid: Keep away from heat, flame, ignition sources, impact, friction, electrostatic discharge and strong shock.

Materials to Avoid (Incompatibility): Corrosives (strong acids and strong bases or alkalis).

Hazardous Decomposition Products: Nitrogen Oxides (NO_X), Carbon Monoxide (CO)

Hazardous Polymerization: Will not occur.

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken in Case Material is Released or Spilled: Protect from all ignition sources. In case of fire evacuate all personnel to a safe distant area and allow to burn or fight fire remotely. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If explosive powder is spilled from damaged detonating cord, remove all other explosives from the spill area. Wet down and clean spilled powder using a damp sponge or rag, avoid applying friction or pressure to the explosive, and place in a (Velostat) electrically conductive bag. Contamination of this material with sand, grit or dirt will render the material more sensitive to detonation. If no fire danger is present, and product is undamaged and/or uncontaminated, repackage product in original packaging or other clean DOT approved container. Ensure that a complete account of product has been made and is verified. Follow applicable Federal, State, and local spill reporting requirements.

Waste Disposal Method: Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation: Not required for normal handling.

Respiratory Protection: None normally required.

Protective Clothing: Work gloves and work clothing that reduce the possibility of skin abrasion and that would prevent contact with spilled explosive powder is suggested.

Eye Protection: Safety glasses or goggles are recommended.

Other Precautions Required: None.

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be taken in handling and storage: Store in cool, dry, well-ventilated location. Store in compliance with Federal, State and local regulations. Only properly qualified and authorized personnel should handle and use explosives. Keep away from heat, flame, ignition sources, impact, friction, electrostatic discharge and strong shock.

Precautions to be taken during use: Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death. Avoid breathing the fumes or gases from detonation of explosives. Detonation in confined or unventilated areas may result in exposure to hazardous fumes or oxygen deficiency.

Other Precautions: It is recommended that users of explosive materials be familiar with the Institute of Makers of Explosives Safety Library Publications.

SECTION X - SPECIAL INFORMATION

This product contains the following substances that are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

Chemical Name	CAS Number	% By Weight
None		

DYNO NOBEL INC. Disclaimer

The information contained herein is provided for reference purposes only and is intended only for persons having relevant technical skills. Because conditions and manner of use are outside of our control, the user is responsible for determining the conditions of safe use of the product. While the information is believed to be correct, DYNO NOBEL INC. shall in no event be responsible for any damages whatsoever, directly or indirectly, resulting from the publication or use of or reliance upon the information contained herein. **(No warranty, either expressed or implied, of merchantability or fitness for a particular purpose, or of any nature with respect to the product, or to the information, is made herein.)**

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E-MAIL: DNNA.HSE@AM.DYNONOBEL.COM
FOR 24 HOUR EMERGENCY CALL 800-424-9300

MSDS# 1108

DATE: 01/24/05

Replaces MSDS
1108 05/09/03

SECTION I - PRODUCT IDENTIFICATION

Trade Name(s): DYNO® Cast BOOSTERS - D10, D15, D25, D35, D45, D65, D90, D135
DYNO® Cast BOOSTERS – C30, C35, C40, C45, C90
DYNO® SLIDER BOOSTERS - DS35, DS45, DS90
DYNO® CORD SENSITIVE BOOSTERS - CS35, CS45, CS90, CS135
SEIS X®
DYNO® STINGER
DYNO AV100
Ballistic Disc 5.0

Product Class: Cast Booster

Product Appearance & Odor: Tan to brown solid with no odor. May also be silvery gray. Packaged in paper or plastic tube.

DOT Hazard Shipping Description: Booster 1.1D UN0042 II

NFPA Hazard Classification: Not Available (See Section IV - Special Fire Fighting Procedures)

SECTION II - HAZARDOUS INGREDIENTS

Ingredients:	CAS#	% (Range)	ACGIH TLV-TWA
Pentaerythritol Tetranitrate (PETN)	78-11-5	10-70	No Value Established
Trinitrotoluene	118-96-7	30-90	0.5 mg/m^3
RDX	121-82-4	0-55	No Value Established
HMX	2691-41-0	0-20	No Value Established

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

SECTION III - PHYSICAL DATA

Melting Point: 176° F (80° C) (TNT)

Vapor Pressure: 0.042mm Hg at 80° C (TNT)

Vapor Density: Not applicable

Density: 1.55 - 1.65 g/cc

Percent Volatile by Volume: Not applicable

Solubility in Water: < 0.01%

Evaporation Rate (Butyl Acetate = 1): Not applicable

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: Not applicable **Flammable Limits:** Not applicable

Extinguishing Media: (See Special Fire Fighting Procedures section).

Special Fire Fighting Procedures: Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions.

Unusual Fire and Explosion Hazards: Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

SECTION V - HEALTH HAZARD DATA

Effects of Overexposure

Eyes: Particulates in the eye may cause irritation, redness, and tearing. Prolonged or repeated contact may cause cataracts, optic neuritis, blurred vision or amblyopia.

Skin: Prolonged contact may cause irritation, severe eczema and sensitization dermatitis. TNT may be absorbed through the skin, which may be indicated by orange staining on exposed skin. See systemic effects below.

Ingestion: Harmful if swallowed. See systemic effects below.

Inhalation: Inhalation of dusts may cause irritation, sneezing or coughing. See systemic effects below.

Systemic or Other Effects: TNT is an irritant, neurotoxin, hepatotoxin, nephrotoxin and bone marrow depressant. Although exposure is unlikely, acute or chronic exposure may cause sensitization dermatitis, headache, dizziness, jaundice, lethargy, or problems with the liver or blood such as toxic nephritis, aplastic anemia, hemolytic anemia or methemoglobin formation. PETN is a known coronary vasodilator, and ingestion or inhalation may result in a lowering of blood pressure, headache or faintness, and a decreased tolerance for grain alcohol. Repeated over-exposure may result in chest pains in the absence of exposure.

Emergency and First Aid Procedures

Eyes: Irrigate with running water for at least fifteen minutes. If irritation persists, seek medical attention.

Skin: Remove contaminated clothing. Wash skin thoroughly with soap and water.

Ingestion: Seek medical attention.

Inhalation: In case of irritation, remove to fresh air. Seek medical attention if chronic symptoms occur.

Special Considerations: None.

SECTION VI - REACTIVITY DATA

Stability: Stable under normal conditions, may explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

Conditions to Avoid: Keep away from heat, flame, friction, impact, ignition sources and strong shock.

Materials to Avoid (Incompatibility): Corrosives (strong acids and bases or alkalis).

Hazardous Decomposition Products: Nitrogen Oxides (NO_X), Carbon Monoxide (CO)

Hazardous Polymerization: Will not occur.

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken in Case Material is Released or Spilled: Protect from all ignition sources. In case of fire evacuate area not less than 2,500 feet in all directions. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If no fire danger is present, and product is undamaged and/or uncontaminated, repackage product in original packaging or other clean DOT approved container. Ensure that a complete account of product has been made and is verified. Follow applicable Federal, State and local spill reporting requirements.

Waste Disposal Method: Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation: Not required for normal handling.

Respiratory Protection: None normally required.

Protective Clothing: Non-permeable gloves and work clothing that reduce skin contact are recommended.

Eye Protection: Safety glasses are recommended.

Other Precautions Required: None.

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be taken in handling and storage: Store in cool, dry location. Store in compliance with all Federal, State and local regulations. Keep away from heat, flame, ignition sources or strong shock.

Precautions to be taken during use: Avoid breathing the fumes or gases from detonation of explosives. Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death.

Other Precautions: It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.

SECTION X - SPECIAL INFORMATION

This product contains the following substances that are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

Chemical Name	CAS Number	% By Weight
None Applicable		

DYNO
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MSDS# 1108

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SECTION I - PRODUCT IDENTIFICATION

Trade Name(s): DYNO® Cast BOOSTERS - D10, D15, D25, D35, D45, D65, D90, D135
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DYNO® SLIDER BOOSTERS - DS35, DS45, DS90
DYNO® CORD SENSITIVE BOOSTERS - CS35, CS45, CS90, CS135
SEIS X®
DYNO® STINGER
DYNO AV100
Ballistic Disc 5.0

Product Class: Cast Booster

Product Appearance & Odor: Tan to brown solid with no odor. May also be silvery gray. Packaged in paper or plastic tube.

DOT Hazard Shipping Description: Booster 1.1D UN0042 II

NFPA Hazard Classification: Not Available (See Section IV - Special Fire Fighting Procedures)

SECTION II - HAZARDOUS INGREDIENTS

Ingredients:	CAS#	% (Range)	ACGIH TLV-TWA
Pentaerythritol Tetranitrate (PETN)	78-11-5	10-70	No Value Established
Trinitrotoluene	118-96-7	30-90	0.5 mg/m^3
RDX	121-82-4	0-55	No Value Established
HMX	2691-41-0	0-20	No Value Established

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

SECTION III - PHYSICAL DATA

Melting Point: 176° F (80° C) (TNT)

Vapor Pressure: 0.042mm Hg at 80° C (TNT)

Vapor Density: Not applicable

Density: 1.55 - 1.65 g/cc

Percent Volatile by Volume: Not applicable

Solubility In Water: < 0.01%

Evaporation Rate (Butyl Acetate = 1): Not applicable

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: Not applicable

Flammable Limits: Not applicable

Extinguishing Media: (See Special Fire Fighting Procedures section).

Special Fire Fighting Procedures: Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions.

Unusual Fire and Explosion Hazards: Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

SECTION V - HEALTH HAZARD DATA

Effects of Overexposure

Eyes: Particulates in the eye may cause irritation, redness, and tearing. Prolonged or repeated contact may cause cataracts, optic neuritis, blurred vision or amblyopia.

Skin: Prolonged contact may cause irritation, severe eczema and sensitization dermatitis. TNT may be absorbed through the skin, which may be indicated by orange staining on exposed skin. See systemic effects below.

Ingestion: Harmful if swallowed. See systemic effects below.

Inhalation: Inhalation of dusts may cause irritation, sneezing or coughing. See systemic effects below.

Systemic or Other Effects: TNT is an irritant, neurotoxin, hepatotoxin, nephrotoxin and bone marrow depressant. Although exposure is unlikely, acute or chronic exposure may cause sensitization dermatitis, headache, dizziness, jaundice, lethargy, or problems with the liver or blood such as toxic nephritis, aplastic anemia, hemolytic anemia or methemoglobin formation. PETN is a known coronary vasodilator, and ingestion or inhalation may result in a lowering of blood pressure, headache or faintness, and a decreased tolerance for grain alcohol. Repeated over-exposure may result in chest pains in the absence of exposure.

Emergency and First Aid Procedures

Eyes: Irrigate with running water for at least fifteen minutes. If irritation persists, seek medical attention.

Skin: Remove contaminated clothing. Wash skin thoroughly with soap and water.

Ingestion: Seek medical attention.

Inhalation: In case of irritation, remove to fresh air. Seek medical attention if chronic symptoms occur.

Special Considerations: None.

SECTION VI - REACTIVITY DATA

Stability: Stable under normal conditions, may explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

Conditions to Avoid: Keep away from heat, flame, friction, impact, ignition sources and strong shock.

Materials to Avoid (Incompatibility): Corrosives (strong acids and bases or alkalis).

Hazardous Decomposition Products: Nitrogen Oxides (NO_X), Carbon Monoxide (CO)

Hazardous Polymerization: Will not occur.

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken In Case Material is Released or Spilled: Protect from all ignition sources. In case of fire evacuate area not less than 2,500 feet in all directions. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If no fire danger is present, and product is undamaged and/or uncontaminated, repackage product in original packaging or other clean DOT approved container. Ensure that a complete account of product has been made and is verified. Follow applicable Federal, State and local spill reporting requirements.

Waste Disposal Method: Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation: Not required for normal handling.

Respiratory Protection: None normally required.

Protective Clothing: Non-permeable gloves and work clothing that reduce skin contact are recommended.

Eye Protection: Safety glasses are recommended.

Other Precautions Required: None.

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be taken in handling and storage: Store in cool, dry location. Store in compliance with all Federal, State and local regulations. Keep away from heat, flame, ignition sources or strong shock.

Precautions to be taken during use: Avoid breathing the fumes or gases from detonation of explosives. Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death.

Other Precautions: It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.

SECTION X - SPECIAL INFORMATION

This product contains the following substances that are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

Chemical Name	CAS Number	% By Weight
None Applicable		

DYNO
Dyno Nobel

MATERIAL SAFETY DATA SHEET
DYNO NOBEL INC.
2650 DECKER LAKE BOULEVARD, SUITE 300
SALT LAKE CITY, UTAH 84119
PHONE: 801-364-4800 FAX: 801-328-6452
E-MAIL: DNNA.HSE@AM.DYNONOBEL.COM
FOR 24 HOUR EMERGENCY CALL
CHEMTREC 800-424-9300 CANUTEC 613-996-6666

MSDS# 1126

DATE: 01/24/05

Replaces MSDS
1126 10/20/03

SECTION I - PRODUCT IDENTIFICATION

Trade Name(s): PRIMALINE®
PRIMACORD®
PRIMASHEAR™
OPTICORD®
GEOSEIS®
LOW FLEX™
FIRELINE CORD

Product Class: Detonating Cord

Product Appearance & Odor: Flexible cord of woven textile with a protected explosive core of PETN (white crystalline powder) and covered by a white or colored plastic or textile jacket. May have a waxed finish. No odor.

DOT Hazard Shipping Description: Cord, Detonating 1.1D UN0065 II

NFPA Hazard Classification: Not Applicable (See Section IV - Special Fire Fighting Procedures)

SECTION II - HAZARDOUS INGREDIENTS

			Occupational Exposure Limits	
Ingredients	**CAS#**	**%**	**OSHA PEL-TWA**	**ACGIH TLV-TWA**
Pentaerythritol tetranitrate (PETN)	78-11-5	-----*	None[1]	None[2]

[1] Use limit for particulates not otherwise regulated (PNOR): Total dust, 15 mg/m^3 ; respirable fraction, 5 mg/m^3.
[2] Use limit for particulates not otherwise classified (PNOC): Inhalable particulate, 10 mg/m^3 ; respirable part., 3 mg/m^3.

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

* Core powder is 100% PETN. The approximate amount of PETN in a given grade of cord is expressed as that number of grams of PETN per linear meter of cord. Range is from 1 to 280 gram/meter. Example: PRIMALINE® 5 contains approximately 5 grams PETN per meter of cord. (1 gram/meter = 4.7 grains/foot)

SECTION III - PHYSICAL DATA

Boiling Point: Not Applicable (PETN decomposes at melting point, about 141°C)

Vapor Pressure: Not Applicable

Vapor Density: (Air = 1) Not Applicable

Percent Volatile by Volume: Not Applicable

Solubility in Water: Insoluble.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Extinguishing Media: (See Special Fire Fighting Procedures section.)

Special Fire Fighting Procedures: Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe, distant location. Allow fire to burn unless it can be fought remotely or with fixed extinguishing systems (sprinklers). For transportation fires involving large quantities of detonating cord, such as a trailer load, evacuate no less than 2,500 feet in all directions.

Unusual Fire and Explosion Hazards: Can explode or detonate under fire conditions. Burning or detonating material may produce toxic vapors.

SECTION V - HEALTH HAZARD DATA

Effects of Overexposure
This is a packaged product that will not result in exposure to the explosive core material under normal conditions of use.

Eyes: May cause irritation, redness and tearing.

Skin: PETN is not known as a skin irritant or sensitizer.

Ingestion: PETN is moderately toxic if ingested. See systemic effects below.

Inhalation: See systemic effects below.

Systemic or Other Effects: PETN is a known coronary vasodilator, and ingestion or inhalation may result in a lowering of blood pressure, headache or faintness, and a decreased tolerance for grain alcohol. Repeated over-exposure may result in chest pains in the absence of exposure. Systemic effects by ingestion include dermatitis.

Carcinogenicity: No constituents are listed by NTP, IARC or OSHA.

Emergency and First Aid Procedures

Eye: Irrigate with running water for at least fifteen minutes. If irritation persists, seek medical attention.

Skin: Wash with soap and water.

Ingestion: Seek medical attention.

Inhalation: Remove to fresh air. If symptoms persist, seek medical attention.

Special Considerations: None.

SECTION VI - REACTIVITY DATA

Stability: Stable under normal conditions, may explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

Conditions to Avoid: Keep away from heat, flame, ignition sources, impact, friction, electrostatic discharge and strong shock.

Materials to Avoid (Incompatibility): Corrosives (strong acids and strong bases or alkalis).

Hazardous Decomposition Products: Nitrogen Oxides (NO_X), Carbon Monoxide (CO)

Hazardous Polymerization: Will not occur.

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken in Case Material is Released or Spilled: Protect from all ignition sources. In case of fire evacuate all personnel to a safe distant area and allow to burn or fight fire remotely. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If explosive powder is spilled from damaged detonating cord, remove all other explosives from the spill area. Wet down and clean spilled powder using a damp sponge or rag, avoid applying friction or pressure to the explosive, and place in a (Velostat) electrically conductive bag. Contamination of this material with sand, grit or dirt will render the material more sensitive to detonation. If no fire danger is present, and product is undamaged and/or uncontaminated, repackage product in original packaging or other clean DOT approved container. Ensure that a complete account of product has been made and is verified. Follow applicable Federal, State, and local spill reporting requirements.

Waste Disposal Method: Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation: Not required for normal handling.

Respiratory Protection: None normally required.

Protective Clothing: Work gloves and work clothing that reduce the possibility of skin abrasion and that would prevent contact with spilled explosive powder is suggested.

Eye Protection: Safety glasses or goggles are recommended.

Other Precautions Required: None.

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be taken in handling and storage: Store in cool, dry, well-ventilated location. Store in compliance with Federal, State and local regulations. Only properly qualified and authorized personnel should handle and use explosives. Keep away from heat, flame, ignition sources, impact, friction, electrostatic discharge and strong shock.

Precautions to be taken during use: Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death. Avoid breathing the fumes or gases from detonation of explosives. Detonation in confined or unventilated areas may result in exposure to hazardous fumes or oxygen deficiency.

Other Precautions: It is recommended that users of explosive materials be familiar with the Institute of Makers of Explosives Safety Library Publications.

SECTION X - SPECIAL INFORMATION

This product contains the following substances that are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

Chemical Name	CAS Number	% By Weight
None		

African Explosives Limited

Product Safety Data Sheet

Conforms to 91/155/EEC and ISO 11014-1

Safety fuse - Durafuse, Stopefuse, Whitestar fuse

1 Identification of the substance / preparation and of the company / undertaking

Product name : Safety fuse - Durafuse, Stopefuse, Whitestar fuse

Product use : Narrow reef stoping and development applications.

Synonyms : Not available.

Chemical formula : Not applicable.

Supplied by : African Explosives Limited
PO Modderfontein, 1645.
Republic of South Africa

Emergency telephone number : **(+27 11) 608-3300.**

2 Composition/information on ingredients

Substance/preparation : Preparation

Chemical name* Europe	CAS No.	%	EC number	Classification
potassium nitrate	7757-79-1	10-30	231-818-8	O; R8 Xi; R36/38
sulfur	7704-34-9	5-15	231-722-6	F; R11 Xi; R36/37
See Section 16 for the full text of the R Phrases declared above				

The balance of the mass of this product is made up of inert plastics, natural fibres, charcoal, rheology modifiers and wetting agents

*** Occupational exposure limit(s), if available, are listed in section 8**

3 Hazards identification

The preparation is classified as dangerous according to Directive 1999/45/EC and its amendments.

Classification : E; R2

Additional hazards : After ignition. Dust and fumes may be harmful by inhalation on repeated exposure.

Effects and symptoms : Pre-use: Hazardous materials are encapsulated, no exposure during normal handling is therefore expected.
Post-use: Minimal exposure risk is expected as quantities of hazardous components used are small.
For more details on the toxicological properties of the hazardous components, see section 11.

Aggravating conditions : No additional remark.

See toxicological information (section 11)

4 First aid measures

First-aid measures

Inhalation : Pre-use: Hazardous materials are encapsulated, no exposure during normal handling is therefore expected.
Post-use: Minimal exposure risk is expected as quantities of hazardous components used are small.
For more details on the toxicological properties of the hazardous components, see section 11.

Ingestion : Not the normal route of entry.

Skin contact : Not the normal route of entry.

Eye contact : Not the normal route of entry.

Notes to physician : No specific treatment, treat symptomatically.

Protection of first-aiders : No additional information.

5 Fire-fighting measures

Extinguishing Media

Suitable : Do not fight fire.

Not suitable : No additional remark.

Unusual fire/explosion hazards : Explodes when heated.

Hazardous thermal decomposition products : These products are nitrogen oxides (NO, NO_2...), sulfur oxides (SO_2, SO_3...). Some metallic oxides.

Special fire-fighting procedures : When controlling fire before involvement of explosives, fire-fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear. Fire-fighters' protective clothing will provide limited protection. DO NOT FIGHT FIRE WHEN IT REACHES MATERIAL. Withdraw from fire and let it burn. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. First move people out of line-of-sight of the scene and away from windows.

Protection of fire-fighters : No additional remark.

6 Accidental release measures

Personal precautions : Evacuate surrounding areas.

Environmental precautions and clean-up methods : Do not touch damaged container or spilled material. Do not clean-up or dispose except under supervision of a specialist. Call for assistance on disposal.

Note: see section 8 for personal protective equipment and section 13 for waste disposal.

7 Handling and storage

Handling : Keep locked up. Take precautionary measures against electrostatic discharges. Keep away from sources of ignition - No smoking. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label.

Storage : Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). See section 16 for specific regulations.

Packaging materials

Recommended use : Use original container.

Not suitable : No additional remark.

8 Exposure controls/personal protection

Engineering measures : Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Hygiene measures : Wash hands after handling compounds and before eating, smoking, using lavatory, and at the end of day.

Occupational exposure limits :

Ingredient name	Occupational exposure limits
No additional information.	

Recommended monitoring procedures : No additional information.

Personal protective equipment

Respiratory system : None required; however, use of adequate ventilation is good industrial practice.

Skin and body : No special protective clothing is required.

Hands : No special protective clothing is required.

Eyes : Safety glasses with side shields.

9 Physical and chemical properties

Physical state : Plastic coated fuse which contains blackpowder and textiles. Colour coded as follows :
> Durafuse - Green
> Stopefuse 290 - Red
> Whitestar fuse - White

Color : Not applicable.

Odor : Not applicable.

Odor threshold : Not applicable.

Boiling point : Not applicable.

Melting point : Not applicable.

Density : Not applicable.

Vapor density : Not applicable.

Vapor pressure : Not applicable.

Evaporation rate (butyl acetate = 1) : Not applicable.

Solubility : Not applicable.

Octanol/water partition coefficient : Not applicable.

pH : Not applicable.

Flash point : Not available.

Fire hazards in presence of various substances : Not applicable.

Auto-ignition temperature : 230 C

Explosive properties : Explosive in presence of open flames, sparks and static discharge, or shocks.

Lower explosion limit : Not available.

Viscosity : Not applicable.

10 Stability and reactivity

Stability : The product is stable.

Conditions to avoid : Heating may cause an explosion. shock

Materials to avoid : None identified.

Hazardous Decomposition Products : These products are nitrogen oxides (NO, NO_2...), sulfur oxides (SO_2, SO_3...). Some metallic oxides.

Hazardous polymerization : Will not occur.

11 Toxicological information

Potential acute health effects

Eyes : Hazardous ingredients : Hazardous in case of eye contact (irritant).

Skin : Hazardous ingredients : Hazardous in case of skin contact (irritant). Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Inhalation : Hazardous ingredients : Slightly hazardous in case of inhalation.

Ingestion : Hazardous ingredients : May cause burns to mouth, throat and stomach.

Target organs : No additional information.

Acute toxicity :

Ingredient name	Test	Result	Route	Species
potassium nitrate	LD50	3750 mg/kg	Oral	Rat
	LD50	1901 mg/kg	Oral	Rabbit
sulfur	LDLo	175 mg/kg	Oral	Rabbit

Special remarks on toxicity to animals : No additional remark.

Specific effects :

Ingredient name	Carcinogenic effects	Mutagenic effects	Developmental toxicity	Impairs fertility
No evidence.				

Special remarks on chronic effects on humans : No additional remark.

Special remarks on other toxic effects on humans : No additional remark.

12 Ecological information

Ecotoxicity Data :

Ingredient name	Species	Period	Result
potassium nitrate	Poecilia reticulata (LC50)	96 hours	180 mg/l
	Poecilia reticulata (LC50)	96 hours	188 mg/l
	Poecilia reticulata (LC50)	96 hours	191 mg/l
	Poecilia reticulata (LC50)	96 hours	200 mg/l
sulfur	Daphnia magna (EC50)	48 hours	>5000 mg/l
	Lepomis macrochirus (LC50)	96 hours	<14 mg/l
	Lepomis macrochirus (LC50)	96 hours	>180 mg/l
	Oncorhynchus mykiss (LC50)	96 hours	>180 mg/l

Ecological information :

Mobility : Not available.

Soil/water partition coefficient (K_{OC}) : Not available.

Persistence/degradability : Not readily biodegradable.

Bioaccumulative potential : Not expected to bioaccumulate.

Ingredient name	Persistence/degradability						Bioaccumulative potential		
	BOD_5	COD	ThOD	Aquatic half-life	Photolysis	Biodegradability	$LogP_{ow}$	BCF	Potenti
No additional information.									

Remarks : May be harmful to the environment if released in large amounts.

13 Disposal considerations

Methods of disposal : Waste must be disposed of in accordance with federal, state and local environmental control regulations. Call for assistance on disposal. Disposal of this product should only be done by trained personnel.

Waste classification : Hazardous waste.

European waste catalogue (EWC) : Not available.

14 Transport information

International transport regulations

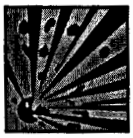
Regulatory Information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
ADR/RID Class	0105	FUSE, SAFETY	1.4S			**Limited quantity** **LQ0** **CEFIC Tremcard** **61S1897**
ADN Class	0105	FUSE, SAFETY	1.4S			-
IMDG Class	0105	FUSE, SAFETY	1.4S			**Emergency schedules (EmS)** **F-B, S-X** **Remarks** **Packaging Instructions: P140**
IATA-DGR Class	0105	FUSE, SAFETY	1.4S			**Packaging Instruction** **Passenger Aircraft** **Quantity limitation: 25 kg** **Packaging Instructions: 140** **Cargo Aircraft** **Quantity limitation: 100**

Safety fuse - Durafuse, Stopefuse, Whitestar fuse						
						kg Packaging instructions: 140

15 Regulatory information

EU Regulations

Hazard symbol(s) :



Explosive

Indication of Danger

Risk phrases : R2- Risk of explosion by shock, friction, fire or other sources of ignition.

Safety phrases : S16- Keep away from sources of ignition - No smoking.
S33- Take precautionary measures against static discharges.
S34- Avoid shock and friction.
S35- This material and its container must be disposed of in a safe way.

Product use : Classification and labeling have been performed according to EU directives 67/548/EEC, 1999/45/EC including amendments and the intended use.
- Industrial applications.

16 Other information

Full text of R-Phrases with no. appearing in Section 2 : R8- Contact with combustible material may cause fire.
R36/38- Irritating to eyes and skin.

Text of classifications appearing in Section 2 : O - Oxidizing
Xi - Irritant

Other special considerations : South African users should ensure that they comply with the Explosives Act, Act no. 26 of 1956 as amended. The material is classified as Class 6, Division 2, and Category X, Group 6A product. International users should comply with the Acts and Regulations as applicable in their respective countries.

History

Date of printing : **24/04/2004.**

Date of issue : **23/04/2004.**

Date of previous issue : **No Previous Validation.**

Prepared by : **AEL Technical Department.**

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

Orica Brasil Ltda.
Avenida Industria Química Mantiqueira, 317 Lorena – São Paulo
Telephone: 0800-172505 or +55 12 553-3111

EMERGENCY CONTACTS FOR CHEMICAL EMERGENCIES (24 HOUR) INVOLVING TRANSPORTATION, SPILL, LEAK, RELEASE, FIRE, ACCIDENTS, LOST, STOLEN OR MISPLACED EXPLOSIVES: 0800-172505 or +55 12 553-3111

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Powergel (Packaged Emulsion)
MSDS Number: 40060
Date Issued: 05-FEB-99
Product Use: A detonator-sensitive emulsion explosive.

SECTION 2 - COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENT(S) % (w/w) ACGIH TWA CAS NO.
Ammonium Nitrate 60-100 Not Listed. 6484-52-2
Sodium Nitrate 5-10 10 mg/m3. 7631-99-4
(nuisance dust)
Sodium Perchlorate 5-10 Not Listed. 7601-89-0
Aluminum 1-5 2 mg/m3 7429-90-5

SECTION 3 - HAZARDS IDENTIFICATION

Emergency Overview: Risk of explosion by shock, friction, fire or other sources of ignition. May cause skin irritation.
Irritating to eyes. May cause methemoglobinemia. May cause liver damage. May cause kidney damage. Read the entire MSDS for a more thorough evaluation of the hazards.

SECTION 4 - FIRST AID MEASURES

General: In case of accident or if you feel unwell, seek medical advice IMMEDIATELY (show the product label where possible).
Inhalation: Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical advice IMMEDIATELY.
Skin Contact: Wash affected areas thoroughly with soap and water. If irritation, redness, or a burning sensation develops and persists, obtain medical advice.
Eye Contact: Immediately flush eyes with running water for a minimum of 20 minutes. Hold eyelids open during flushing. If irritation persists, repeat flushing. Obtain medical attention IMMEDIATELY.
Ingestion: If victim is alert and not convulsing, rinse mouth out and give 200-300 mL (1 cup) of water to dilute material. DO NOT induce vomiting. Never give anything by mouth to an unconcious person. If spontaneous vomiting occurs, have victim lean forward with head positioned to avoid breathing in of vomitus, rinse mouth and administer more water. Obtain medical attention IMMEDIATELY.
Note to Physicians: Symptomatic. Administer oxygen if there are signs of cyanosis. If clinical condition deteriorates, administer 10 cc Methylene Blue intravenously. It is unlikely for this to be required with methemoglobin level of less than 40%.

SECTION 5 - FIRE-FIGHTING MEASURES

Flash Point: This product does not flash.
Flammable Limits (Lower): Not applicable.
Flammable Limits (Upper): Not applicable.
Auto Ignition Temperature: 230-265°C (446-509°F)
Decomposition Temperature: Ammonium nitrate will spontaneously decompose at 210 Deg. C.
Rate of Burning: Does not sustain burning at atmospheric pressure.
Explosive Power: 375 - 475 kJ/100 g.
Sensitivity to Mechanical Impact: Expected to be sensitive to mechanical impact.

Appearance: White to grey viscous liquid.
Odor: Odorless.
pH: Not available.
Vapor Pressure (mm Hg at 20°C): Negligible
Vapor Density (Air=1): Not available.
Boiling Point: Not applicable.
Melting Point: Not applicable.
Solubility (Water): Negligible.
Solubility (Other): Slightly soluble in organic solvents.
Specific Gravity: 1.14
Evaporation Rate: Not applicable.

SECTION 10 - STABILITY AND REACTIVITY

Hazardous Decomposition Products: Thermal decomposition products are toxic and may include hydrocarbons, oxides of carbon and nitrogen; hydrogen chloride and phosgene, in lesser amounts.
Chemical Stability: Stable at room temperature.
Conditions to Avoid: Keep away from heat, impact, and friction.
Incompatibility with other Substances: Avoid oxidizable materials, metal powder, bronze & other copper alloys, fuels (e.g. lubricants, machine oils), fluorocarbon lubricants, acids, corrosive liquids, chlorates, sulphur, sodium nitrite, charcoal, coke and other finely divided combustibles. Strong oxidizing and reducing agents.
Hazardous Polymerization: Will not occur.

SECTION 11 - TOXICOLOGICAL INFORMATION

Summary: May cause skin irritation. Irritating to eyes. May cause liver damage. May cause kidney damage. May cause methemoglobinemia.
TOXICOLOGICAL DATA:
PRODUCT: None established for product.
INGREDIENTS:
Ammonium Nitrate:
Oral LD50 (rat) = 2217 mg/kg
Dermal LD50 (rabbit) = 3000 mg/kg
Sodium Nitrate:
Oral LD50 (rat) = 1267 - 4300 mg/kg
Sodium Perchlorate:
Oral LD50 (rat) 2100 mg/kg
POTENTIAL HEALTH EFFECTS:
Inhalation: Inhalation is not a likely route of exposure at normally encountered temperatures and is thus not applicable. Combustion products may be irritating.
Skin Contact: May cause skin irritation.
Eye Contact: Moderate irritant causing moderate initial pain.
Ingestion: Highly unlikely under normal industrial use. Ingestion may cause irritation of the gastrointestinal tract.
Subchronic Effects: Signs and symptoms of kidney damage generally progress from oliguria, to blood in the urine, to total renal failure. Ingestion may cause methemoglobinemia. Initial manifestation of methemoglobinemia is cyanosis, characterized by navy blue lips, tongue and mucous membranes, with skin colour being slate grey. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia. If ingested, nitrates may be reduced to nitrites by bacteria in the digestive tract. Signs and symptoms of nitrite poisoning include methemoglobinemia, nausea, dizziness, increased heart rate, hypotension, fainting and, possibly, shock.
Chronic Effects: Long-term overexposure to perchlorates may cause bone marrow damage. Some cases of aplastic anemia have been reported. Perchlorates suppress the uptake of iodine by the thyroid gland and can, in rare cases, cause goiter in chronically exposed workers. It is our belief that, under conditions of normal occupational exposure, this product should not pose such a hazard to the worker.
Carcinogenicity: The ingredients of this product are not classified as carcinogenic by ACGIH (American Conference of Governmental Industrial Hygienists) or IARC (International Agency for Research on Cancer), not regulated as carcinogens by OSHA (Occupational Safety and Health Administration), and not listed as carcinogens by NTP (National Toxicology Program).
Mutagenicity: There is no evidence of mutagenic potential.
Reproductive Effects: No information is available and no adverse reproductive effects are anticipated.

Sensitivity to Static Discharge: Not expected to be sensitive to static discharge.
Hazardous Reactions: None known.
Fire and Explosion Hazards: Explodes on overheating when contained and, thus, fires involving large quantities of the material should not be fought.
Extinguishing Media: See below.
Fire Fighting Procedures: DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry.
Fire Fighting Protective Equipment: Use self-contained breathing apparatus and special protective clothing.
NOTE: Also see "Section 10 - Stability and Reactivity"

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Spills, Leaks, or Releases: Avoid the use of metal tools containing iron and/or copper. Be careful to avoid shock, friction, and contact with grit. Collect product for recovery or disposal. For release to land, contain discharge by constructing dykes or applying inert absorbent; for release to water, utilize damming and/or water diversion to minimize the spread of contamination. Collect contaminated soil and water, and absorbent for proper disposal. Notify applicable government authority if release is reportable or could adversely affect the environment.
Deactivating Chemicals: Detergents will break up emulsions if mixed in.

SECTION 7 - HANDLING AND STORAGE

Handling: This product is an explosive and should only be used under the supervision of trained personnel. The use of coveralls is recommended. Use normal good industrial hygiene and housekeeping practices.
Storage Requirements: Store under moderate temperatures recommended by a technical service representative. Store under dry conditions in a well ventilated magazine that has been approved for either detonator storage or explosive storage. Do NOT store explosives in a detonator magazine or detonators in an explosive magazine. Keep away from heat, sparks and flames. Keep containers closed. Explosives should be kept well away from initiating explosives; protected from physical damage; separated from oxidizing materials, combustibles, and sources of heat. Keep away from incompatibles.
Storage Temperature: Ideal storage temperature is 20-40 Deg. C. Do not expose sealed containers to temperatures above 40 Deg. C (104 Deg. F).

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

PREVENTIVE MEASURES:
Recommendations listed in this section indicate the type of equipment which will provide protection against over exposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.
Engineering Controls: General ventilation is recommended. Full handling precautions should be taken at all times.
PERSONAL PROTECTIVE EQUIPMENT:
Eye Protection: Use chemical safety goggles when there is potential for eye contact.
Skin Protection: Rubber gloves and protective clothing made from cotton should be impervious under normal conditions of use. User should verify impermeability under normal conditions of use prior to general use.
Respiratory Protection: A NIOSH/MSHA-approved respirator, if required.
EXPOSURE GUIDELINES:
PRODUCT: None established for product.
HAZARDOUS INGREDIENT(S):
Ammonium Nitrate:
Energetic Solutions Guideline 5 mg/m3 internal TWA
Sodium Nitrate:
ACGIH TLV 10 mg/m3 (nuisance dust)
Aluminum:
ACGIH TLV 2 mg/m3
OSHA PEL 2 mg/m3

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Alternate Name(s): Not available
Chemical Name: Not applicable.
Chemical Family: Emulsion packaged explosives.
Molecular Formula: Not applicable.

Teratogenicity and Fetotoxicity: No information is available and no adverse teratogenic/embryotoxic effects are anticipated.
Synergistic Materials: None known.

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicological Information: Dissolves slowly in water. Harmful to aquatic life at low concentrations.
Environmental Effects: Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.
Persistence and Degradation: Water-in soluble and remains explosive. With extended time periods, some ingredients will solubilize.

SECTION 13 - DISPOSAL CONSIDERATIONS

Burn under supervision of an expert at a government-approved explosive burning ground or destroy, by detonation in boreholes, in accordance with applicable local, provincial and federal regulations. Call upon the services of an Energetic Solutions Inc. Technical Representative.

SECTION 14 - TRANSPORT INFORMATION

Proper Shipping Name: Explosive, Blasting, Type E
Class/Division: 1.1D
Product Indentification Number (PIN): UN0241
Packing Group: II
Transportation Emergency Telephone Number: 1-800-424-9300.
DOT Class: Explosive, Blasting, Type E

SECTION 15 - REGULATORY INFORMATION

CANADIAN CLASSIFICATION:
This product has been classified in accordance with the hazard criteria of the CPR (Controlled Products Regulations) and this MSDS (Material Safety Data Sheet) contains all the information required by the CPR.
Controlled Products Regulations (WHMIS) Classification: This product is an explosive and is not regulated by WHMIS.
CEPA / Canadian Domestic Substances List (DSL): The substance(s) in this product is/are on the Canadian Domestic Substances List (CEPA DSL).
IARC Classification: None of the components of this product are listed on IARC.
USA CLASSIFICATION:
OSHA Classification:
Physical: Explosive. Oxidizer.
Health: Irritant.
Target Organ: Liver Eye. Skin. Respiratory tract. Liver. Urinary tract. Gastrointestinal tract. Blood/hematopoietic system. Endocrine system. Immune system.
SARA Regulations Sections 313 and 40 CFR 372: This product contains the following toxic chemical(s) subject to reporting requirements: Ammonium Nitrate (6484-52-2) Aluminum (7429-90-5)
Ozone Protection and 40 CFR 42: This product does not contain nor is it manufactured with ozone depleting substances.
Other Regulations/Legislation which apply to this product: Florida, New Jersey Special Health Hazard Substance List, Minnesota Hazardous Substance List, California Director's List of Hazardous Substances, New Jersey RTK Environmental Hazardous Substance, Rhode Island Hazardous Substance List, Massachusetts Right-to-Know, Pennsylvania Right-to-Know, New Jersey Right-to-Know.

SECTION 16 - OTHER INFORMATION

MATS Index: 59920
REFERENCES:
RTECS-Registry of Toxic Effects of Chemical Substances, CCINFOdisc, Canadian Centre for Occupational Health and Safety, National Institute for Occupational Safety and Health, U.S. Dept. of Health & Human Services, Cincinnati, 1998. Clayton, G.D. and Clayton, F.E., Eds., Patty's Industrial Hygiene and Toxicology, 3rd ed., Vol. IIA,B,C, John Wiley and Sons, New York, 1981. Supplier's Material Safety Data Sheets. CHEMINFO, HSDB, & NIOSH through "CCINFOdisc", Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada. 1998 "CHEMINFO", "CHRIS", "TDG","DOT", through "CCINFOdisc", Occupational Health and Safety, Hamilton,

Ontario, Canada. Documentation of the Threshold Limit Values and Biological Exposure Indices, 5th ed., American Conference of Governmental Industrial Hygienists Inc., Cincinnati, 1986. Threshold Limit Values and Biological Exposure Indices for 1997, American Conference of Governmental Industrial Hygienists, Cincinnati, 1997. Windholz, Martha, Ed., The Merck Index, 11th ed., Merck and Co., Inc., Rahway, New Jersey, 1989.

Prepared By: Safety, Health and Environment + 55 12 553-3111. The information contained herein is offered only as a guide to the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. It is not intended to be all-inclusive and the manner and conditions of use and handling may involve other and additional considerations. No warranty of any kind is given or implied and Orica Brasil Ltda. will not be liable for any damages, losses, injuries or consequential damages which may result from the use of or reliance on any information contained herein. This Material Safety Data Sheet is valid for three years from the date issued.

DYNO
Dyno Nobel

MATERIAL SAFETY DATA SHEET
DYNO NOBEL INC.
11TH FLOOR CROSSROADS TOWER
SALT LAKE CITY, UTAH 84144
PHONE: 801-364-4800 FAX: 801-328-6452
E-MAIL: DNNA.HSE@AM.DYNONOBEL.COM
FOR 24 HOUR EMERGENCY CALL 800-424-9300

MSDS# 1076

DATE: 01/22/03

Supersedes MSDS
1076 06/28/02

SECTION I - PRODUCT IDENTIFICATION

Trade Name(s):
ELECTRIC SUPER™ COAL
ELECTRIC SUPER™ LP
ELECTRIC SUPER™ SP
ELECTRIC SUPER™ SEISMIC
ELECTRIC SUPER™ STARTER
ELECTRIC SUPER™ INSTANT
TRONA

Product Class: Commercial Electric Detonators and Accessory Products

Product Appearance & Odor: Metal cylinder with varying length of attached plastic coated wires.

DOT Hazard Shipping Description: Detonators, Electric 1.1B UN0030 II
Or
Detonators, Electric 1.4B UN0255 II

NFPA Hazard Classification: Not Applicable (See Section IV - Special Fire Fighting Procedures)

SECTION II - HAZARDOUS INGREDIENTS

Ingredients:	CAS#	MAXIMUM %	TLV-ACGIH
Tungsten	7440-33-7	0.47	5 mg/m³
Barium Chromate	10294-40-3	1.2	0.1 mg (Cr_2O_3)/m³
Lead Compounds	----------	0.59	0.05 mg (Pb)/m³
Pentaerythritol Tetranitrate (PETN)	78-11-5	3.7	No Value Established
Boron	7440-42-8	0.21	No Value Established
Potassium Perchlorate	7778-74-7	0.50	No Value Established
Diazodinitrophenol (DDNP)	4682-03-5	0.26	No Value Established
Nitrocellulose	9004-70-0	<0.1	No Value Established

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations.

SECTION III - PHYSICAL DATA

Boiling Point: Not Applicable
Vapor Density: Not Applicable
Percent Volatile by Volume: Not Applicable

Vapor Pressure: Not Applicable
Density: Not Applicable
Solubility in Water: Not Applicable

Amount of Lead in Detonator Product Line *				
Product	Pb compounds in detonator [grams]	Pb compounds in detonator [Wt.%]	Pb in detonator [grams]	Pb in detonator [Wt. %]
Electric Super SP	0.0412	0.588%	0.0357	0.5093%
Electric Super LP	0.0412	0.588%	0.0357	0.5093%
Electric Super Coal	0.0412	0.588%	0.0357	0.5093%
Electric Super Seismic	0.0000	0.0000%	0.0000	0.0000%

***Applies to only the detonator (source of lead). Do not use case weight or weight of any other component.**

DYNO NOBEL INC. Disclaimer

The information contained herein is provided for reference purposes only and is intended only for persons having relevant technical skills. Because conditions and manner of use are outside of our control, the user is responsible for determining the conditions of safe use of the product. While the information is believed to be correct, DYNO NOBEL INC. shall in no event be responsible for any damages whatsoever, directly or indirectly, resulting from the publication or use of or reliance upon the information contained herein. **(No warranty, either expressed or implied, of merchantability or fitness for a particular purpose, or of any nature with respect to the product, or to the information, is made herein.)**

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken in Case Material is Released or Spilled: Protect from all ignition sources. In case of fire evacuate area not less than 2,500 feet in all directions. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If no fire danger is present, and product is undamaged and/or uncontaminated, repackage product in original packaging or other clean DOT approved container. Ensure that a complete account of product has been made and is verified. Follow applicable Federal, State, and local spill reporting requirements.

Waste Disposal Method: Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation: Not required for normal handling.

Respiratory Protection: None normally required.

Protective Clothing: Cotton clothing is suggested.

Eye Protection: Safety glasses are recommended.

Other Precautions Required: None.

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be taken in handling and storage: Store in cool, dry, well-ventilated location. Store in compliance with Federal, State, and local regulations. Keep away from heat, flame, ignition sources, strong shock, and electrical impulses.

Precautions to be taken during use: Avoid breathing the fumes or gases from detonation of explosives. Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death.

Other Precautions: It is recommended that users of explosive materials be familiar with the Institute of Makers of Explosives Safety Library Publications.

SECTION X - SPECIAL INFORMATION

This product contains the following substances that are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

Chemical Name	CAS Number (Use Toxic Chemical Category Code)	% By Weight
Barium Compounds	N040	1.2
Lead Compounds	N420	0 – 0.59
Chromium Compounds	N090	1.2

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: Not Applicable **Flammable Limits:** Not Applicable

Extinguishing Media: None

Special Fire Fighting Procedures: Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions.

Unusual Fire and Explosion Hazards: Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

SECTION V - HEALTH HAZARD DATA

Effects of Overexposure

Eyes: No exposure to chemical hazards anticipated with normal handling procedures. Particulates in the eye may cause irritation, redness and tearing.

Skin: No exposure to chemical hazards anticipated with normal handling procedures.

Ingestion: No exposure to chemical hazards anticipated with normal handling procedures.

Inhalation: Not a likely route of exposure.

Systemic or Other Effects: None known.

Emergency and First Aid Procedures

Eyes: Irrigate with running water for at least fifteen minutes. If irritation persists, seek medical attention.

Skin: Wash with soap and water.

Ingestion: Seek medical attention.

Inhalation: Not applicable.

Special Considerations: None

SECTION VI - REACTIVITY DATA

Stability: Stable under normal conditions, may explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

Conditions to Avoid: Keep away from heat, flame, ignition sources, strong shock and electrical impulse. Do not attempt to disassemble.

Materials to Avoid (Incompatibility): Corrosives (acids and bases)

Hazardous Decomposition Products: Carbon Monoxide (CO), Nitrous Oxides (NO_x), Lead (Pb) and various oxides and complex oxides of metals.

Hazardous Polymerization: Will not occur.

nitrochem

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Maitland, On K0E 1P0
Tel: (613)348-3681
Fax: (613)348-3043

MATERIAL SAFETY DATA SHEET

SECTION I. MATERIAL IDENTIFICATION

UN#: 1942
CAS: 006 484 522

Emergency Telephone#: 613-348-3990
Canutec #: 613-996-6666
Chemtrec#:1 1-800-424-9300

NFPA/HMIS RATING: Health 2, Flammability 0, Reactivity 3
WHMIS Class 'C' Oxidizer

Manufacturer: **Nitrochem Corp**
Trade/Material Name: **Ammonium Nitrate - Industrial Grade**

Description: Solid granule,
Other Designations: AMMONIUM SALT
Chemical Formula: NH_4N0_3

SECTION II. INGREDIENTS AND HAZARDS

INGREDIENT NAME	HAZARD	PROVISIONAL LIMIT
AMMONIUM NITRATE	No TLV established No IDHL established Recommend Nuisance Rating (SAX) Respirable: 5 mg/m^3	Air 0.05 mg/m^3 Data by TRW Systems Group for EPA contract (August 1973, NTIS PB 244 591) LD_{50}: 5300 mg/kg LC_{50}: NOT AVAILABLE

COATING :(PRILLS WILL BE COATED WITH ONE OF THE THREE ANTICAKING AGENTS LISTED BELOW).

1. Clay - CAS NO:1332-58-7 : ≤1.0% — Respiratory Nuisance

2. Galoryl ATH - CAS NO: 57-11-4:
   - Mineral Oil - CAS NO: 67254-74-4:{<0.2%` — No TWA established; TLV 5mg/M^3 suggested for oil mist

3. Hydrogenated Tallow Amine-CAS NO: 61788-45-2:
   - Hydrotreated Mineral Oil distillate - CAS NO: 64742-52-5:{<0.2%No TLV established

SECTION III. PHYSICAL DATA

Appearance and Odour

Solid odourless granule

Boiling Point:210°C (410°F)
Vapour Pressure:N.A.
Vapour Density:N.A.
Solubility, Cold water:118g/100g H_2O

Bulk Density:750-820 kg/m^3 (47-51 lb/cubic ft.)
Melting Point:169.6°C (336°F)
pH [0.1N Solution]:5.4
Molecular Weight:80.06

SECTION IV. FIRE AND EXPLOSION DATA

FLASH POINT	AUTOIGNITION TEMP.	FLAMMABILITY LIMITS IN AIR:
N/A	N/A	LOWER: N/A UPPER: N/A

EXTINGUISHING MEDIA

Use flooding amounts of water in early stages of fire. Keep upwind. This is an oxidizing agent which supports combustion and is an explosive hazard if heated under confinement that allows high pressure build-up. Upon heating, it gives off toxic gases of nitrogen oxides. Prevent contamination of NH_4NO_3 with other combustible materials that may cause possible explosion of the entire mass. Evacuate surrounding area of ammonia nitrate if sensitized with fuel and if adetonation is anticipated. Desensitize material with flooding amounts of water.

Firefighters should wear self-contained breathing apparatus.

SECTION V. REACTIVITY DATA

NH_4NO_3 is stable when stored and used under proper conditions. It is hygroscopic. Strong oxidizing agent. Reacts with strong alkalies to liberate ammonia.

Conditions to Avoid

Avoid unintentional contact with diesel oil. Many powdered metals react violently or explosively with fused NH_4NO_3 below 200C (392F) as follows: Al, Sb, Bi, Cd, Cr, Co, Cu, Fe, Pb, Mg, Mn, Ni, Sn, Zn, and brass. When contaminated with oil, harcoal, or other organic substances or flammable liquids can be considered an explosive, capable of detonation by combustion when confined or by shock from adjacent explosions. Sensitivity to detonation increases when heated (particularly dangerous if confined). The effect of various impurities on the thermal stability of solid NH_4NO_3 has been examined. [Ubanski, chem 1/2 Tech of Explosives. 1965 vol.2]

SECTION VI. HEALTH HAZARD INFORMATION

SUMMARY OF RISKS

Contact with skin may cause mild skin irritations. Individuals may be exposed to nitrogen oxides due to decomposition of NH_4NO_3 at high temperatures. This is a toxic gas which can quickly cause acute respiratory problems.

Use NIOSH/MSHA approved respirator/ total dust respirator when handling clay coated prills.

FIRST AID

Eye Contact:	Immediately flush with tempered running water. Get medical attention.
Skin Contact:	Flush with tempered water. Wash immediately with soap and water. Get medical attention.
Inhalation:	Remove to fresh air. Restore and/or support breathing as needed.
Ingestion:	Seek immediate medical attention.

This product is not known as a carcinogen. Toxic hazard rating (SAX)

TOXICITY

Acute Local:	Slight irritant, allergen, inhalation
Acute Systemic:	No information
Chronic Local:	Slight irritant, allergen, inhalation
Chronic Systemic:	No information
Reproductive Toxicity:	N/A
Mutagenicity:	N/A
Teratogenicity:	N/A
Toxicologically:	LD_{50}: 5300 mg/kg
	LC_{50}: NOT AVAILABLE
Synergistic Products:	N/A

SECTION VII. SPILL, LEAK AND DISPOSAL PROCEDURES

Report all spills immediately. Remove sources of heat or ignition. Sweep spill into a non-combustible container.

Disposal - For discharge follow Federal, Provincial, State or Municipal Regulations.

Aquatic Toxicity Rating:	TLm 96, over 1000-100 ppm
Provisional Limit:	Water and Soil 45 mg/l (as NO_3)

SECTION VIII. SPECIAL PROTECTION INFORMATION

Provide general exhaust ventilation in the workplace and storage area.
A NIOSH/MHSA approved dust respirator should be available when the work situation warrants its use.
Wear rubber gloves and chemical goggles to minimize exposure and skin contact during handling.

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

STORAGE SEGREGATION

Store in well-ventilated area with building made of noncombustible material equipped with automatic sprinkler system. Prevent entrapment of NH_4NO_3 by eliminating floor drains and depressions. Protect containers against Physical damage. Store separate from other chemicals and combustible materials.
[See code for storage of NH_4NO_3, NFPA 490 and 495]. Do not store above 54C (129F).
Store under dry conditions. A possible explosive hazard when contaminated with many other materials.

DOT: oxidizer
LABEL: oxidizer
DOT CLASS: OXIDIZER

ABBREVIATIONS

TC_{Lo}:	Lowest Published Toxic Concentration
LC_{Lo}:	Lowest Published Lethal Concentration
TWA:	Time Weighted Average
TLV:	Threshold Limit Value
LD_{50}:	Lethal Dose 50
LC_{50}:	Lethal Concentration 50
TLm:	Median Tolerance Limit

SECTION X. PREPARATION INFORMATION

Contact Health/Safety Assistant, Nitrochem Corp. during business hours 08:00 to 16:00 EST. Phone 1-613-348-3681 extension 209.

NOTICE: The information presented herin is based on data considered to be accurate as of the date of preparation of this Material Safety Data Sheet. However, no warranty or representation expressed or implied, is made of the accuracy of the forgoing data and safety information.

Date: 2000-03-09

DYNO
Dyno Nobel

MATERIAL SAFETY DATA SHEET
DYNO NOBEL INC.
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PHONE: 801-364-4800 FAX: 801-328-6452
E-MAIL: DNNA.HSE@AM.DYNONOBEL.COM
FOR 24 HOUR EMERGENCY CALL
CHEMTREC 800-424-9300 CANUTEC 613-996-6666

MSDS# 1122

DATE: 10/20/03

Supersedes MSDS
1080 01/28/03
1107 01/22/03
1122 08/01/03
EBCo ENSI123

SECTION I - PRODUCT IDENTIFICATION

Trade Name(s):
NONEL® MS
NONEL® LP
NONEL® SL
NONEL® TD
NONEL® MS CONNECTOR
NONEL® TWINPLEX™
NONEL® STARTER
NONEL® EZ DET®
NONEL® EZTL™
NONEL® EZ DRIFTER ®
OPTIMIZER® OPTISLIDE®
OPTIMIZER® OPTISURFACE®
OPTIMIZER® OPTI-TL®

Product Class: Non-electric Detonators

Product Appearance & Odor: Aluminum cylindrical shell with varying length and diameter of attached colored plastic tubing. The detonator may be enclosed in a plastic housing, and an assembly may contain two detonators. Odorless.

DOT Hazard Shipping Description: Detonators, non-electric 1.1B UN0029 II -or-
Detonator assemblies, non-electric 1.1B UN0360 II -or- Detonator assemblies, non-electric 1.4B UN0361 II

NFPA Hazard Classification: Not Applicable (See Section IV - Special Fire Fighting Procedures)

SECTION II - HAZARDOUS INGREDIENTS

Ingredients	CAS#	EXPOSURE LIMITS OSHA PEL	TLV-ACGIH
Pentaerythritol Tetranitrate (PETN)	78-11-5	None[1]	None[2]
Lead Azide	13424-46-9	0.05 mg (Pb)/m^3	0.05 mg (Pb)/m^3
Lead	7439-92-1	0.05 mg (Pb)/m^3	0.05 mg (Pb)/m^3
Silicon	7440-21-3	15 mg / m^3 (total dust) 5 mg / m^3 (respirable fraction)	10 mg / m^3
Selenium	7782-49-2	0.2 mg/m^3	0.2 mg/m^3
Red Lead (Lead tetroxide)	1314-41-6	0.05 mg (Pb)/m^3	0.05 mg (Pb)/m^3
Titanium dioxide	13463-67-7	15 mg/m^3	10 mg/m^3
Barium Chromate	10294-40-3	1 mg (CrO_3)/10m^3 (ceiling) 0.5 mg (Ba)/m^3	0.01 mg (Cr)/m^3 0.5 mg (Ba)/m^3
Lead Chromate	7758-97-6	0.05 mg (Pb)/m^3 1 mg (CrO_3)/10m^3 (ceiling)	0.15 mg (Pb)/m^3 0.012 mg (Cr)/m^3
Barium Sulfate	7727-43-7	0.5 mg (Ba)/m^3	10 mg/m^3
Potassium Perchlorate	7778-74-7	None[1]	None[2]
Silica (crystalline)	61790-53-2	See Note Below	0.05 mg/m^3 (resp frac)
Molybdenum	7439-98-7	None[1]	None[2]
Tungsten	7440-33-7	None[1]	5 mg/m^3 (TWA) 10 mg/m^3 (STEL)
Aluminum	7429-90-5	15 mg/m^3 (total dust) 5 mg/m^3 (respirable fraction)	5 mg/m^3
Antimony	7440-36-0	0.5 mg/m^3	0.5 mg/m^3
Cyclotetramethylene Tetranitramine (HMX)	2691-41-0	None[1]	None[2]

[1] Use limit for particulates not otherwise regulated (PNOR): Total dust, 15 mg/m^3 ; respirable fraction, 5 mg/m^3 .
[2] Use limit for particulates not otherwise classified (PNOC): Inhalable particulate, 10 mg/m^3 ; respirable part., 3 mg/m^3 .
Note: The OSHA PEL for crystalline silica is calculated as follows:
Quartz, respirable: 10 mg/m^3 [e] / % SiO_2 + 2 Quartz, total dust: 30 mg/m^3 / % SiO_2 + 2

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

SECTION III - PHYSICAL DATA

Boiling Point: Not Applicable
Vapor Density: Not Applicable
Percent Volatile by Volume: Not Applicable
Evaporation Rate (Butyl Acetate = 1): Not Applicable
Vapor Pressure: Not Applicable
Density: Not Applicable
Solubility in Water: Not Applicable

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: Not Applicable **Flammable Limits:** Not Applicable

Extinguishing Media: (See Special Fire Fighting Procedures section.)

Special Fire Fighting Procedures: Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe, distant location. Allow fire to burn unless it can be fought remotely or with fixed extinguishing systems (sprinklers).

Unusual Fire and Explosion Hazards: Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

SECTION V - HEALTH HAZARD DATA

Effects of Overexposure

This is a packaged product that will not result in exposure to the explosive material under normal conditions of use. Exposure concerns are primarily with post-detonation reaction products.

Eyes: No exposure to chemical hazards anticipated with normal handling procedures. Particulates in the eye may cause irritation, redness, swelling, itching, pain and tearing.

Skin: No exposure to chemical hazards anticipated with normal handling procedures. Exposure to post-detonation reaction products may cause irritation.

Ingestion: No exposure to chemical hazards anticipated with normal handling procedures. Post-detonation reaction product residue is toxic by ingestion. Symptoms may include gastroenteritis with abdominal pain, nausea, vomiting and diarrhea. See systemic effects below.

Inhalation: Not a likely route of exposure. See systemic effects below.

Systemic or Other Effects: None anticipated with normal handling procedures. Repeated inhalation or ingestion of post-detonation reaction products may lead to systemic effects such as respiratory tract irritation, ringing of the ears, dizziness, elevated blood pressure, blurred vision and tremors. Heavy metal (lead) poisoning can occur.
Carcinogenicity: ACGIH classifies Lead as a "Suspected Human Carcinogen" and insoluble Chromium VI as "Confirmed Human Carcinogen". NTP, OSHA, and IARC consider components contained in this detonator carcinogenic.

Emergency and First Aid Procedures

Eyes: Irrigate with running water for at least fifteen minutes. If irritation persists, seek medical attention.

Skin: Wash with soap and water.

Ingestion: Seek medical attention.

Inhalation: Not applicable.

Special Considerations: None

SECTION VI - REACTIVITY DATA

Stability: Stable under normal conditions, may explode when subjected to fire, supersonic shock or high-energy projectile impact.

Conditions to Avoid: Keep away from heat, flame, ignition sources, impact, friction, electrostatic discharge and strong shock. Do not attempt to disassemble.

Materials to Avoid (Incompatibility): Corrosives (acids and bases or alkalis).

Hazardous Decomposition Products: Carbon Monoxide (CO), Nitrous Oxides (NO_X), Sulfides, Chromates, Lead (Pb), Antimony (Sb) and various oxides and complex oxides of metals.

Hazardous Polymerization: Will not occur.

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken in Case Material is Released or Spilled: Protect from all ignition sources. In case of fire evacuate all personnel to a safe distant area and allow to burn or fight fire remotely. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If no fire danger is present, and product is undamaged and/or uncontaminated, repackage product in original packaging or other clean DOT approved container. Ensure that a complete account of product has been made and is verified. If loose explosive powder is spilled, such as from a broken detonator, only properly qualified and authorized personnel should be involved with handling and clean-up activities. Spilled explosive powder is extremely sensitive to initiation and may detonate. Follow applicable Federal, State, and local spill reporting requirements.

Waste Disposal Method: Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation: None required for normal handling. Provide enhanced ventilation after use if in underground mines or other enclosed areas.

Respiratory Protection: None required for normal handling.

Protective Clothing: Cotton gloves are recommended.

Eye Protection: Safety glasses are recommended.

Other Precautions Required: None.

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be taken in handling and storage: Store in cool, dry, well-ventilated location. Store in compliance with Federal, State, and local regulations. Only properly qualified and authorized personnel should handle and use explosives. Keep away from heat, flame, ignition sources, impact, friction, electrostatic discharge and strong shock.

Precautions to be taken during use: Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death. Avoid breathing the fumes or gases from detonation of explosives. Detonation in confined or unventilated areas may result in exposure to hazardous fumes or oxygen deficiency.

Other Precautions: It is recommended that users of explosive materials be familiar with the Institute of Makers of Explosives Safety Library Publications.

SECTION X - SPECIAL INFORMATION

These products contain the following substances that are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

Chemical Name	CAS Number	Max. lbs/1000 units
Lead	7439-92-1	39.4
	(Use Toxic Chemical Category Code)	
Lead Compounds	N420	2.0
Barium Compounds	N040	1.8
Chromium Compounds	N090	1.9

Range* of Section 313 Chemicals in each product

Product	lb Pb per 1000 detonators	lb Pb compounds per 1000 detonators	lb Ba compounds per 1000 detonators	lb Cr compounds per 1000 detonators
NONEL® MS	0 - 27	0.3 – 1.5	0	0
NONEL® LP	0 - 30	0.3 – 2.0	0 - 1.8	0 - 1.9
NONEL® SL	7 - 27	0.3 – 1.5	0	0
NONEL® TD	0 - 18	0.3 – 0.7	0	0
NONEL® MS Connector	5 - 16	0.3 – 0.4	0	0
NONEL® EZ DET®	22 - 36	2.0	0	0
NONEL® EZTL™	5 - 15	0.5 – 0.7	0	0
NONEL® EZ DRIFTER	39.4	1.3	1.2	1.3
NONEL® STARTER	0	0.3	0	0
NONEL® TWINPLEX™	5 - 15	0.3 – 0.7	0	0

*** The exact quantity and weight percent of Section 313 Chemicals in each delay period and wire length for each product is available upon request.**

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